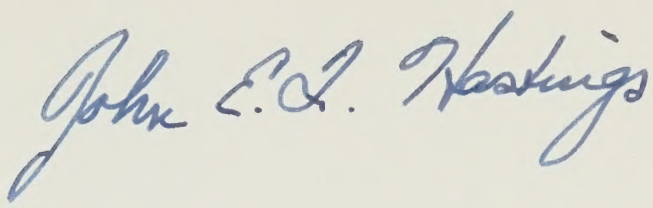
ROYAL COMMISSION ON HEALTH SERVICES

DENTAL EDUCATION IN CANADA

K. J. PAYNTER

1964



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K.J. Paynter

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PREFACE

This study of dental education in Canada was undertaken for the Royal Commission on Health Services to provide information on the present system of educating dentists and how it evolved, the relationship of dental education to general and medical education, how dental education is changing to conform to new requirements for dental services and to economic and social change, and the changing methods by which dentists and dental specialists may be educated in the future. Criticisms have been levelled in an effort to be constructive, on the assumption that if improvements are to be made, areas where they are necessary must be first recognized.

To obtain data for the report each Canadian dental school was visited to make a first-hand inspection of each school and to consult with the Dean and other staff members. As I had anticipated, in every school valuable and frank discussions were held about dental education at the local, national, and international level. Comments and suggestions received in this manner were most useful, and many of them have been incorporated into the report. Additional requests for information made from time to time following these visits were always answered fully and courteously, and for all the help provided by the Deans and staff I am very grateful.

In view of the current changing philosophy of health care in this country, a visit was made to Great Britain to evaluate the effect of the National Health Service on dental education there. Visits were made to three of the dental schools affiliated with London University, namely Guy's, the London, and the Royal Dental Hospitals, and to three provincial schools, – Birmingham, Edinburgh, and Glasgow. The school for postgraduate study at the Eastman Dental Hospital, the Department of Dental Science of the Royal College of Surgeons, and the School for Dental Auxiliaries, all in London, were also visited.

This experience proved to be very worthwhile because it indicated the relationship between the National Health Service and dental education in Great Britain and provided a perspective on the development of the philosophy of dental education and dental research in that country. It was particularly rewarding to have the opportunity to visit the School for Dental Auxiliaries, and to see at first hand the methods being so successfully employed there to train the dental auxiliaries in the more advanced technical procedures involved in restorative dentistry.

In every instance the warmth and cordiality with which I was received made my visit a delight, and the frankness which permeated all the discussions made it singularly valuable. The comments contained in this report on the influence of the National Health Service on dental education are intended as an observation and not a criticism. My observations were limited to the relation between the health scheme and education. No attempt was made to evaluate the health service *per se*.

The co-operation, kindness and help of all those with whom I consulted in Great Britain is deeply appreciated.

A large amount of highly useful data was also made available through the office of the Canadian Dental Association, whose assistance was of inestimable value. In fact had these data not been available my work would have been multiplied many times.

In all instances suggestions have been intended to be constructive. I have freely used the ideas of others in this respect and have tried to give proper acknowledgement. Any failure to do so is through oversight alone.

I have attempted to visualize dental education in the future with the realization that forecasting is a hazardous occupation at best, and with so many variables both known and unknown exerting an influence on the progress of dental education, accuracy in prediction becomes very difficult. However, I have tried to project a picture of the future which would be practical and sensible, and which would be, in my opinion, in the best interests of dental education.

During the course of the study I have enjoyed the assistance of three consultants, – Dr. A.C. Lewis, Toronto, Ontario, Dr. J.P. Lussier, Montreal, Quebec, and Dr. John B. Macdonald, Vancouver, British Columbia. I am grateful for the help all three have provided. Their comments, suggestions, and criticisms were extremely useful. I wish to acknowledge particularly the assistance provided by Professor B.R. Blishen, Director of Research of the Royal Commission on Health Services. Nevertheless I assume responsibility for everything that is contained in this study, and any errors of accuracy or logic are my sole responsibility.

Toronto,
April 1963

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CHAPTER 1

PHILOSOPHY OF DENTAL EDUCATION

"To refuse to see that great changes are at hand, as concerns the standing and practice of the dental profession, is simply to shut one's eyes. Of no one thing are we more fully assured than that the dentistry of today must either advance or give place; to attempt to confine it to its present limits is to seek to control that progress which is itself evolution."[1]

Nearly 90 years later the Secretary General of the Fédération Dentaire Internationale wrote[2] that he was "more than ever convinced that the dental profession must consider whether its system of education and its organization as a profession is adapted to the present and future demands likely to be made upon it as a health service".

These statements, one almost a century older than the other, both refer to one of the most frustrating traits of society and its subdivisions – a resistance to change. The problem remains the same, only the circumstances and people change. Some subdivisions such as the health professions were created to promote the public welfare, yet their survival depends upon their ability to adapt to the changing environment. The history of the development of man, both biological and social, is a story of adjustment and change to meet the demands of a changing environment. The species and social orders that are successful in their adaptation survive, the others disappear. The one thing which a species, a society or a profession cannot do is stand still.

RELATION TO THE DENTAL PROFESSION AND ITS OBLIGATIONS TO THE PUBLIC

The immediate relation between the dental profession and dental education is obvious – all dentists are the product of dental education. Programmes of dental education are to a degree under the supervision of the profession itself, although the schools in this country are all faculties in universities. The dental schools were first established by the profession through its licensing authority, and all of the present teaching programmes in Canada have evolved from the early professionally operated schools. It was during the first quarter of this century that the schools became affiliated with universities.

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[1]Editorial: "The Future of Dentistry." *Dental Cosmos*, 14:608–611,1872.

[2]Leatherman, G.H. "Dentistry and Its Future." *Jour. Am. Coll. of Dentists*, 28:163–186, 1961.

Through legislation governing its various provincial licensing authorities, the dental profession has a responsibility to oversee the programmes of dental education offered by the schools. This is an arrangement with both good and bad features. Licensing boards should ensure that all licenciates have at least a minimum basic knowledge before being permitted to treat patients. The boards must therefore assure themselves that certain basic standards are being maintained. This delicate task has always been handled well in Canada, although in theory the boards could exert considerable influence on the schools through their licensing authority. In all instances an excellent liaison between the Canadian schools and the licensing boards has been established.

The dental profession is organized for one purpose – to be of maximum service to the public. As Gies[1] said "It has no obligations of any kind whatever that individually or collectively are equal to its duty to promote the public welfare". According to the McNair Committee[2] the public welfare is served by the dental profession in four ways.

1. Preventing and relieving pain – a common cause of misery for mankind, particularly because of the violent nature of dental pain.
2. Prevention of loss of efficiency. The person who suffers dental pain also suffers loss of working efficiency and hence the community also suffers. This was such a serious problem in the British Army during the First World War that the Dental Corps was established shortly thereafter to ensure that it would not be so again.
3. Preventing permanent disability – from early loss of teeth with resultant bone loss and subsequent lessening of ability to handle artificial substitutes.
4. Preventing disfigurement, caused not only by irregular and broken teeth, but also by the premature aging of the toothless.

The performance of these services has evolved through a series of steps which are elaborated below, and we are now entering an era when the prevention of the consequences of dental disease as listed above will occur by preventing the disease itself.

In addition to their strictly professional responsibilities, dentists, together with other professional groups, have an obligation for guiding the pattern of national life – an obligation infrequently discussed by dentists. This responsibility for leadership is dependent upon an understanding of social problems, on ability to deal with them, and on moral and ethical values.

The attributes of a dentist – his understanding of oral disease, his technical skill, his judgement, his ability to adjust to social change, and to a lesser extent perhaps his sense of values – depend on the character of dental education.

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[1]Gies, W.J. *Dental Education in the United States and Canada.* Carnegie Foundation for the Advancement of Teaching. New York, 1926.

[2]*Report of the Committe on Recruitment to the Dental Profession.* London: H.M. Stationery Office, Cmd. 9861. October 1956, pp. 11–12.

EVOLUTION AND BASIC PURPOSES OF DENTAL EDUCATION

The development of dental education has been influenced primarily by three factors, the nature of the diseases with which dentists have to contend, the growth of knowledge, and sheer accident of circumstances.

Dental disease has affected mankind since the beginning of time, and it is still one of our most serious public health problems. It has no geographic boundaries, and it affects all races and all ages. Understanding the etiology of the numerous common diseases of the mouth involves not only an intimate knowledge of the development, structure, and local environment of the tooth itself, but a knowledge of the biology of many general body tissues and of human growth as well.

The nature of dental service and the systems of education for dentistry have evolved through a series of overlapping phases which began in very early times, and through which we are still proceeding. In some areas of the world dental service is still provided in the same manner as it was in one of the earlier phases of the evolution of western dentistry. The World Health Organization's Expert Committee on Auxiliary Personnel[1] has outlined these evolutionary stages as follows:

1. In the very earliest stage dental service was rendered as a secondary occupation by a lay person who extracted teeth and provided folk medicine where it was thought to be indicated. In early times this was the only available service. In underdeveloped areas of the world today some additional emergency treatment may be provided by missionary or public health service.
2. As the need grew some lay persons devoted all of their time to dental service. They learned their skills on the job with no formal instruction.
3. As the numbers of people providing dental service grew, professionalization evolved and guilds were established to set standards of training for others who wished to practise. The guilds organized formal courses of training of a year or two duration.
4. As the profession became stronger, dental schools were established which offered courses of from three to six years' duration. The schools at first were independent institutions which later either became incorporated into universities or disappeared. Early education tended to emphasize the technical aspect of dental service. At the same time assistants were trained to work extra-orally. Some dentists in the larger urban areas began to specialize.
5. Finally the pattern now dominant in Canada and other areas developed. Dentists are qualified practitioners, and in some cases they are assisted by auxiliaries trained to perform routine technical operations under the supervision of the dentist. Graduate and postgraduate education has developed in the schools along with programmes of research. Current

[1] World Health Organization: Expert Committee on Auxiliary Personnel. Technical Report Series 163. Geneva: The Organization, 1959, pp. 17—18.

emphasis in the undergraduate course is on an understanding of the etiology of oral disease with a view to its control and prevention. The number and diversification of specialties has increased, although specialists still tend to accumulate in the larger urban areas.

As the dental profession and dental education evolved, the method and concept of handling dental disease changed and each had its influence on the other. Before 1850 those who practised dentistry were largely occupied with procedures related to relief of pain. This phase ended and a new phase began about the time of the development of ether and nitrous oxide for general anaesthetics. Just prior to this, in 1840, the first dental school was established on the North American continent.

During the latter half of the nineteenth century dental technology became highly developed as new materials such as vulcanite, silver amalgam, and gold foil were adapted for use in restoring lost or diseased teeth. A number of North American dental schools were established during this period, some as independent institutions sponsored by the profession, and some as private schools which operated for profit. It is not surprising that dental education was at first largely concerned with technical matters during this technological era of dentistry. Biology and dentistry had not as yet been related, and indeed dentistry missed the renaissance of biological and medical science that occurred during this same period.[1] In addition, the private schools in particular found it necessary for survival to attract students by advertising their programmes on the basis of the newest and most advanced techniques.

Around 1900 there began what is known as the 'era of focal infection' which lasted for about twenty-five years. In this period the relationship between oral and systemic disease became apparent, and the schools recognized the need to broaden instruction in human biology. Programmes in biology were already being offered in the universities, so the dental schools turned to the universities for this instruction and became accepted as part of them. During the next thirty years at least, dental education emphasized control of dental disease through early recognition and treatment of lesions; the importance of dentistry for children became established and research was expanded.

Dentistry has now entered a period where emphasis will be placed on the prevention of dental disease – a logical sequence in the scheme of things.

The transition from one era to another may be almost imperceptible, and the skills and knowledge developed in one are carried over into the next. Modern dental education must therefore prepare future dentists to relieve pain and other acute problems of dental disease, to restore lost organs or parts skilfully and to direct others to do so, to eliminate infection, and to teach people the best way to control their own oral disease. At the same time dental education must include a proper concept of the public health aspects of dental disease and modern methods of prevention. These are rather staggering responsibilities.

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[1]Waite, F.C. "The Divergent Paths of Dental and Medical Education since 1840." *American Dent. Surgeon*, 49:349–367, 1929.

RELATION TO THE UNIVERSITIES

MacKinnon[1] has described the university as a "community of scholars engaged in the pursuit and dissemination of knowledge". He goes on to say "it has no function in directing people, performing social services, or making things. Its business is thinking, discussing, talking, experimenting and learning – working with minds and producing ideas". One might query the realism of such a philosophy in the light of expansion of modern universities to include many programmes which, on the surface, do not seem to fit into this category. Nevertheless the functions of a university still remain basically twofold, the acquisition of new knowledge through research, and the transmission of knowledge by teaching. All activities that are related to either of these functions properly belong in a university. Those not related to the two functions should not be university responsibilities.

Often professional people tend to think of the university in the light of their own experience and are either unaware of or ignore the broader opportunities for understanding and feeling available through a university experience. Humphreys[2] has expressed the view that a higher education should fit a person "to lead a full life at a high level of thought, feeling and conduct, for those are the three activities that respectively serve the values of truth, beauty, and goodness". Opportunity for such fulfilment is available, although not always utilized, in the university.

The acceptance of Canadian dental schools into the universities occurred in the early 1900's, during the 'era of focal infection' which had succeeded the period in dentistry during which so many technological advances were made. The immediate heritage of the dental schools was one of techniques; the future was related much more intimately to biology. Thus the dental schools came to the universities seeking rather than giving. They sought the necessary background of biological knowledge that was lacking in dental education, and they sought the experience, available through a university, that would more suitably equip the dentist to assume his role as a leader in society.

When they became part of the universities, dental schools brought clinicians with them but not philosophers, teachers in dental subjects but not researchers. It soon became painfully obvious that the dental schools would have to contribute to the universities and not just accept benefits from them if they were to profit fully from the association. An effort to fulfil this responsibility was made in the 1920's with early attempts to establish programmes of research in the dental schools. The duty of the schools in this respect, however, has really only begun to be served within the last decade or two. During this period research into the problems of dental disease has been undertaken in all of the schools, although as yet the amount of time, energy and money devoted to this purpose is far from adequate. Graduate educational programmes have begun in some schools so that more dental teachers are being prepared with experience in methods of investi-

[1]MacKinnon, F. "The University: Community or Utility." *The C.A.U.T. Bulletin*, 10:4–11, 1961.

[2]Humphreys, H.F. "Universities and Dental Education." *Brit. Dent. Jour.* 103:155–158, 1957.

gation. The next few years of staff replacement should see acquisition of many more teachers trained in research methods. The dental school should then become, in effect, a research institute with emphasis on biological phenomena, using technical procedures as tools, to serve a higher purpose and not as an end unto themselves.

When the dental schools became part of the universities they brought their clinics with them and thus the clinical service given patients as part of the the clinical instruction of dental students became the function of the university. This function has been questioned from time to time, particularly when contrasted with the clinical instruction given to medical students by affiliated but separate institutions. There are no dental hospitals in Canada. Dental departments in general medical hospitals are generally hopelessly inadequate to provide the clinical experience necessary to train dentists. Since the universities have accepted the responsibility for educating dental students, the dental clinics must remain part of the dental faculties at least until some other means can be found to provide dental students with this necessary experience. The university purpose would be better served if the clinics were to become research centres rather than just treatment centres. As such they could serve a much more valuable and significant purpose than they do at the present time. They have not been used for carrying out clinical research primarily because of the lack of clinical staff trained in research methodology. This is a reflection of the major problem facing dental schools today, the training and hiring of sufficient numbers of adequately trained staff.

Entrance into the university has done much more for dental education than the provision of courses in biology. It has made salaries available to support staff independent of the number of students in the school, or the amount of service provided. This has permitted minimum admission standards to be established and teaching standards to be developed comparable to those of the university as a whole. It has permitted a freedom of thought and action impossible under a system solely under professional or political direction or influenced by the need to balance books or show a profit. Under the present arrangement dentistry is emerging as a true university discipline.

It has taken time for the dental schools to understand their function in a university. Rushton[1] wrote,"When dental schools became part of the universities in name they did not at once become a part of them in fact. They are only gradually becoming so. They have been to some extent technical schools with a completely different outlook on the duties and qualifications of teachers from that which obtains in universities. The time the teacher spent in the school was expected to be totally occupied in teaching and treatment of patients; whereas the university teacher has a prime duty to the advancement of knowledge in his subject, and has in this regard the great advantage of time and opportunity and of association with others trained in different disciplines but with similar aims. The incorporation of dental schools in universities is both the result and cause

[1]Rushton, M.A. "The Young Dental Teacher." *Brit. Dent Jour.*, 103:158-159, 1957.

of the demand for at least a fair proportion of this type of teacher in dentistry, but the schools are still in a very poor position to provide the environment which such teachers will seek".

But the understanding is developing. Dental schools are working to serve the true basic purpose of a university by teaching, training teachers, researching and training researchers, although there is still a great variation in the degree to which these functions are carried out across the country. The relative emphasis of the various activities carried out in the dental schools is changing from the concept once dominant (and unfortunately still over-emphasized in many areas) that manual skills are most important, to the philosophy recently expressed by Westin.[1] He wrote that the three basic responsibilities of dental schools in order of priority are the conduct of scientific research, giving scientific instruction, and giving specialized treatment in all forms of odontology. This latter philosophy must be more widely accepted if the dental schools are finally to achieve true university status.

RELATION TO CONTEMPORARY DENTISTRY

With all these good intentions, the fact still remains that immediately upon graduation, the dentist will be swamped with the incredible volume of repair work that is needed to take care of the results of the widespread and progressive mass of dental disease, and he will have a moral obligation to do all he can to repair this damage. Knowing this must influence the degree of attention the average dental student gives to his various courses. Students will wonder why they should work hard to study basic sciences except to pass examinations. What do basic sciences really have to do with today's practice of dentistry? Unfortunately many instructors, let alone students, would be hard pressed to give an answer.

Awareness of their future activities has an influence on the learning process of dental students. This has been well demonstrated in Great Britain, where a National Dental Health Service has been in operation since 1948. The dental fee schedule under the health service allows relatively higher remuneration for certain items such as amalgam fillings than for others such as routine periodontal therapy or preventive procedures. This is not to imply that these latter services cannot be rendered under the health services. They can, and remuneration for them is reasonable, although permission must be obtained by the dentist to carry out such procedures, and thus they are not done too often. It is evident in the schools that because the students know that placement of amalgam restorations will be their major source of income in the future they are more strongly motivated to learn in this area. Teaching preventive dentistry, periodontics, or the more advanced restorative procedures in dentistry has become a far more difficult job to do. Fortunately all students are not so motivated.

Many educators have pointed out the need for an education that will inspire the dental student to continue to be a student – to be prepared to seek out new and more advanced knowledge throughout his career. Probably no one has done

[1]Westin, G. "Alternate Roads to Advanced Education for the Dentist – Sweden." *Jour. Dent. Ed.*, 25:153–156, 1961.

this more forcibly than G.V. Black[1] who stated many years ago "..... the dental school cannot make all of its graduates practitioners, nor can any state board sift out all incompetent men, or men who may rapidly become incompetent through careless or immoral habits. A student, under the influence thrown around him in school, may do fair work both in his studies and in his operations, but after the last cramming for the state board examination he may throw aside his books, fall into careless habits in operating, and within a few years become a thoroughly incompetent man. I have known such students to sell all their books to the second hand dealer the next week after passing these examinations. I wish to Heaven they would sell their instruments too and seek other employment.

"The professional man has no right to be other than a continuous student. ....."

The concept of continuing study by dentists has generally been applied only to the art and science of dentistry. But a much broader concept is needed. The "intolerable complacency" by the professional man referred to by Levy[2] must be dissolved. The crying need of people for relief from the ravages of dental disease has not changed greatly during the centuries, but because people are becoming more aware of the value of such relief requests for dental service are increasing. Current developments in the health field make it obvious that in the future dental science will not be limited to those who can afford it, or even to those who care to seek it voluntarily; the recognition is dawning that society as a whole will benefit if its members are dentally fit.

How will total dental fitness come about? Obviously change from present methods is required. It is a responsibility of dental educators to help lead the way, to act with imagination and a sense of responsibility in developing methods by which services may be distributed more widely and economically, and to develop methods for preventing disease. These efforts must be encouraged and inspired by tradition but not hampered by it.

RELATION TO FUTURE TRENDS IN DENTISTRY

Surely the acts and thoughts of dental educators will not for ever be dominated by the need for mass repair. If this does occur, the outlook is gloomy indeed. There is good evidence, however, that such will not be the case. It has been demonstrated that by educating people to care for themselves the need for dental treatment can be reduced. The widespread application of sound public health procedures for reducing dental decay such as fluoridation of communal water supplies will reduce it even further. The utilization of auxiliary help will permit individual dentists to spread their services wider. But perhaps the most significant thing of all is the healthy growth of the research programmes now going on in the dental schools. From research have come all our advances and understanding in techniques and in prevention; from the same source and no

[1] Gurley, J.E. *The Evolution of Dental Education.* American College of Dentists, St. Louis, 1960, p. 16.

[2] Levy, B.M. "A Challenge to Dental Education". *Jour. N.Y. State D.A.*, 26:37–40, 1955.

other will come all advances in the future. Here then, is where the responsibility of dental schools to do research comes into proper perspective. Here is the real hope for sound planning for the future. Our concepts of research in dentistry must broaden to include more than biological, clinical, or materials research; it must be much more concerned with our methods of education,[1] and our relationships with people. Bertrand Russell has said[2] "The sum of human knowledge and the complexity of human problems are perpetually increasing; therefore every generation must overhaul its educational methods if time is to be found for what is new. We must preserve the balance by means of compromises. The humanistic elements in education must remain, but they must be sufficiently simplified to leave room for the other elements without which a new world rendered possible by science can never be created". The overhauling, simplifying,discarding, and retaining will require research as imaginative, daring and probably as ultimately worth-while as any now under way.

[1]Ellis, R.G. "A Review of Dental Education Suggests a Fertile Field for Research." *Austr. Dent. Jour.*, 1:8—11, 1956.

[2]Gurley, J.E. *Op. cit.*, p. 30.

CHAPTER 2

HISTORY OF DENTAL EDUCATION

The pattern of dental education in Canada that has developed over the past 90 years is more understandable if its history is related to developments in other parts of the world, particularly in the United States, where formal dental education began on this continent.

The practice of dentistry as a craft goes far back into antiquity and in general it has always been a separate branch of treatment from medicine. It has been recorded more than 400 years before the birth of Christ that the treatment of teeth was considered as a separate branch of the healing arts.

In France during the early 1500's barbers treated teeth and performed almost all surgical procedures, although there was a Faculty of Medicine at the University of Paris at the time. During this century surgeons became licensed and surgery began to pass out of the hands of the barbers, although they still continued to perform dental services. Across the channel in England, similar developments were occuring and in 1544 Henry VIII granted a charter to the Barber Surgeons Company of England to which women were admitted. During the same period some consideration was being given to the improvement of dental service. The first textbook in dentistry was published in Leipzig in 1530 and 50 years later students of dentistry were admitted to the University of France. By 1622 a number of men had been granted the title of surgeon-dentist, although the title was not really fully established for a number of years atter that. During the reign of Louis XIV, the surgeon-dentists formed a separate sub division of the Surgeons' Guild and the year after this was arranged, it became law that those who wished to practise in the field of mouth surgery and artificial restoration had to pass prescribed examinations. It is rather interesting that at this time some women were permitted to practise dentistry in France, although this privilege was revoked during the mid-1700's.

In the 17th century in England dentistry was referred to as an independent specialty. The first English text on the subject of dentistry was published by Charles Allan in 1688.

Publication of three highly significant textbooks occurred during the 18th century; Pierre Fauchard's *Le Chirurgien Dentiste* in 1728 put dental treatment on a more scientific plane than ever before and advocated a broader education for dentists. In 1756 Pfaff's *Abhandlung von der Zahn* appeared, and in 1771 John Hunter of England, who was giving lectures on dentistry, published *The Natural*

History of the Human Teeth. Mr. Joseph Fox was appointed dental surgeon at Guy's Hospital in 1799, and at the same time lectures on dentistry were set up in Guy's and in a number of other areas.

No formal dental schools were established in England until 1858 although dental hospitals had been established earlier. These dental hospitals were created as service centres for the poor. They were founded and supported by dentists. For the most part they were independent of medical schools and general hospitals. They did accept some students however, who partly provided cheap labour to operate the hospital and whose fees were used to support the charitable work undertaken. The honorary dental surgeons were responsible for any teaching that was done, a fairly dispirited procedure since there was no economic gain either direct or indirect for those who did the teaching. In 1858 the first dental school was established in the United Kingdom by the Odontological Society of London, and the second school the following year by the College of Dentists of the United Kingdom. Both were private schools.

At about the same time the Royal College of Surgeons arranged to hold examinations for licensure for dental surgery. The College remained the examining body for dentistry in Great Britain for about twenty years. In 1878 the first Dentists' Act in the United Kingdom was passed and the General Medical Council established a register of those qualified to hold the title of dental surgeon. The Act did not prohibit individuals without these qualifications from practising. The General Medical Council also prescribed a curriculum for the training of dentists. It required two years of preceptorship to learn dental mechanics and three years in a medical school and dental hospital. Charles Tomes inspected the examination procedures at the colleges in 1897 and recommended that the one examination be replaced by three, in preliminary science, dental mechanics and a final examination. Tomes' recommendations were put into effect and remained without much alteration until 1922.

Thus in Great Britain the dental schools evolved out of dental hospitals which were originally established as treatment centres for the poor. Initial standards for licensure were set by the Royal College of Surgeons of England and the standards for examinations by the General Medical Council, which incidentally had no dental representation.

While schools were being established and standards for licensure created in England, rapid developments had also been going on in North America. Dentistry was being practised in the United States by the late 1790's, and the first textbooks appeared in the early 1800's. According to Kimball,[1] by 1834 dental services were being provided by three rather distinct classes of individuals. First, there were those who had qualified by a course of study in the principles of medicine and surgery, and who had entered the profession not only to provide themselves with the means of subsistence, but with the aim of raising the standards of practice from the disrepute and degradation into which it had fallen by

[1]Weinberger, B.W. "The Educational Evaluation of the Dental Surgeon." *Dental Cosmos*, 71:516–526, 564–575, 1929.

that time. The second group was composed of individuals who had obtained a preparatory course of medical study and then commenced practising dentistry without having taken the time to study the mechanics of dental operations. These people were held in comparative respect since in due course they did obtain some degree of skill in their operations. although they were criticised for not having obtained this skill before actually inflicting their services on the public. The third group included a great number of charlatans – shoemakers, locksmiths, constables, sailors, in tact anyone who decided he would like to practise dentistry. It is this group that largely created the disrepute and degradation.

John Gurley[1] has described the three types of dentist who practised before 1840 as (1) the physician dentist who had some medical education but who practised dentistry; (2) the surgeon dentist who trained under a preceptor in either surgery or dentistry; and (3) mechanical dentists who had experience in handling metals, jewelry, etc., but who had no background in science or biology.

The first meeting of a dental society in the United States was held in 1834. Shortly thereafter two unsuccessful attempts were made to establish dental schools, the first in Kentucky and the second in New York City. The latter failed to get under way because of staff problems. No money was available at that time for salaries and evidently the local dentists felt they could not spare time from their practice for teaching.

The first dental school in North America was established in Baltimore in 1840, nearly 20 years before the first British school was established. Subsequently many other schools were started, many of which were operated privately or commercially. All the early schools were separate from universities. The first and for many years the only school of dentistry in the United States associated with a university was opened at Harvard in 1867.

This was the era during which dentistry became organized in Canada. British schools had just started and in the United States requirements for qualification and examination had very recently been drawn up; some standards for practice were being established and a number of schools begun.

In 1862, the population of 200,000 in Nova Scotia was being served by about ten individuals, none of whom had a dental degree. In Ontario there were 175 practitioners. The first Dental Act in Canada was passed by the Legislature of the Province of Ontario in 1868. This Act incorporated the Royal College of Dental Surgeons of Ontario (R.C.D.S.) and gave it the dual function of teaching and licensing. Licence requirements stipulated five years of practice in a dental office for registration. Except for a simple act that was passed in Alabama in 1841, the Ontario Act was the first law respecting dental practice on this continent. The regulations for registration were fairly simple by today's standards. With the large number of itinerant dentists who had no formal training whatever moving back and forth across the Canadian-American border at that time, even this five-year requirement proved useful.

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[1]Gurley, J.E. *The Evoluation of Dental Education.* American College of Dentists. St. Louis, 1960.

Following the enactment of the Ontario Dental Act a short-lived attempt to establish a dental school in Toronto was made under the auspices of the Royal College of Dental Surgeons. Attendance at the school was not made a prerequisite for practice and this premature effort failed after its first term. In 1875 the R.C.D.S., having failed to interest universities in establishing a dental school, formed the first dental school in Canada under its own auspices. At the beginning nominal matriculation standards for entrance were required; the school gave two years of instruction, and candidates were required to spend two years in a preceptorship for licensing.

The University of Toronto was the only institution in Ontario which could offer degrees at this time and in 1888 the dental college became affiliated with the University which established the Doctor of Dental Surgery degree. The first D.D.S. degrees were conferred at a convocation in 1889. Between 1906 and 1925 joint examinations were given by the University and the R.C.D.S. In 1925 the dental school became established as the Faculty of Dentistry, University of Toronto, and the joint examinations were dropped.

In 1868, the year after the R.C.D.S. had been established in Ontario, the Association of Dental Surgeons was incorporated in Quebec Province. In 1889 it became the College of Dental Surgeons of the Province of Quebec with the power to act as a Board of Examiners. Individuals requesting licences to practise in Quebec were required to serve a preceptorship and take a series of short courses in anatomy, chemistry and physiology at either Laval or McGill University. Early in the 1890's the College established a dental school which, in 1893, became affiliated with the school being organized in the University of Bishop's College at Lennoxville. By 1903 the bilingual programme of this school had developed unanticipated complications and it was abolished. At the same time McGill and Laval Universities established English-speaking and French-speaking dental schools respectively. The school at McGill became the Faculty of Dentistry, McGill University by 1920, and the Laval school became the Faculty of Dentistry at the University of Montreal when the University of Montreal obtained its autonomy during the same year.

In 1883 the Manitoba Dental Act was passed establishing the Manitoba Dental Association. By 1896 the Association was trying to establish a course of lectures in dentistry in the Faculty of Medicine at the University of Manitoba. Sixty-one years later the Association's efforts culminated in the establishment of the Faculty of Dentistry, University of Manitoba in 1957. This school graduated its first class in the spring of 1962 – the first new graduating class in Canada in about forty years.

About 1890 Dental Acts were also passed in New Brunswick, Prince Edward Island and Nova Scotia, which each established a board responsible for standards of education and for licensure. In general they required some years of preceptorship for licensure. About 18 years later in 1908, the Maritime Dental College was founded. It was affiliated with the Halifax Medical College of Dalhousie University. Four years later the Maritime Dental College became the first Faculty of Dentistry associated with a university in Canada.

In 1916 in Alberta arrangements had been made with the University of Alberta to give the first two years of instruction for the dental course. Students who took this instruction were to complete their dental training at either Toronto or McGill. The first dental instruction was given in 1917 at the University of Alberta under a department of the medical school. By 1921 the Alberta programme had been extended to three years. By 1924 the complete four-year course was given. The Faculty of Dentistry was established in 1944.

Although dental hygienists had been trained in the United States since 1913 the first course in Canada was established in Toronto during the 1951-52 session. At present three Canadian schools, Toronto, Dalhousie and Alberta are training hygienists, although plans have been made to begin courses in other schools in the near future.

Dental schools in Canada have always enjoyed a close rapport with one another and with schools in the United States. One of the first standing committees formed by the Canadian Dental Association after its establishment in 1902 was the Committee on Dental Education, now the Council on Education. This group is probably the most influential single body guiding the development of dental education in Canada. It has sponsored and financed conferences on many aspects of dental education which have allowed teachers from the Canadian schools to get together to discuss common problems. Several years ago the Council arranged a series of surveys of dental schools by a special committee appointed for that purpose. The surveys have led to some outstanding improvements in teaching facilities and teaching methods in the schools. Within the last year or two a Canadian Fund for Dental Education has been organized to raise funds to finance projects associated with dental education, from teacher training to research in teaching methods.

Liaison with the American schools is maintained largely through membership in the American Association of Dental Schools, an autonomous organization in the United States which guides development of dental education in that country. Canadian participation in the organization has been significant, and Canadian deans have held numerous administrative positions, including the presidency.

CHAPTER 3

FACILITIES

There are six dental schools in Canada, one in each of Alberta, Manitoba, Ontario and Nova Scotia, and two in the Province of Quebec. A seventh has been established in British Columbia but it will not graduate its first class before 1967 or 1968. The six operating schools are capable of graduating a maximum of 338 dentists and 87 dental hygienists each year, the latter being trained in three of the schools as shown in Table 3–1. With two exceptions all the present buildings have been either newly built or extensively modified, and re-equipped within the past five years. The school at the University of Montreal was planned over thirty years ago and has been in operation about twenty years. While new clinical facilities for McGill University were provided within the past decade in the Montreal General Hospital, pre-clinical facilities on campus are nearly half a century old.

The amount of space provided in the buildings varies from 120 to more than 490 square feet per dental student (Table 3–1), although the figures shown are not directly comparable because the utilization of facilities outside the dental school for instruction of dental students varies a great deal from school to school. For example, at the University of Alberta the dental school contains no lecture rooms for its sole use because it is located in the same building as the medical school, and both faculties use the same lecture facilities. On the other hand, at Toronto it was necessary to provide three large lecture rooms for the dental students, partly because this school is located some distance from other university buildings, and partly because the large size of classes prohibits the use of many of the lecture rooms on campus.

A considerable expansion in dental school facilities in Canada has occurred during the last five years. At Alberta the school has been renovated extensively and new buildings have been erected at Toronto and Dalhousie, all accommodating larger classes than before. In addition a new school was begun in Manitoba.

All of the schools have good library arrangements and some, for example at Toronto, Manitoba and Montreal, have their libraries in the dental buildings. Alberta and Dalhousie facilities are located close to the medical library where dental books and periodicals are housed.

TABLE 3–1

LOCATION AND SIZE, CANADIAN DENTAL SCHOOLS, 1961-62

University	Address	Undergraduate Capacity				Building Area[1]	Area per Dental Student
		Dental		Hygienist			
		Class Size	Total	Class Size	Total		
						sq. ft.	sq. ft.
Alberta.....	Edmonton, Alberta	55	220	25	50	54,000	245
Manitoba	Winnipeg, Manitoba	33	132			65,000	493
Toronto	Toronto, Ontario	125	500	50	100	180,000	360
McGill	Montreal, Quebec	40	160			19,000	120
Montreal	Montreal, Quebec	60	240			40,000	167
Dalhousie ...	Halifax, Nova Scotia	25	100	12	24	25,540	255
Total		338	1,352	87	174		

[1]Lecture rooms, laboratories, etc., in other university buildings are used to a varying degree from school to school.

The size of the undergraduate teaching clinics and the number of dental units with which they are equipped varies considerably from school to school. The ratio of the number of dental units to undergraduate dental students varies from one unit to 3.6 students to 1:1.5 students (Table 3–2). The figures for Alberta, Toronto and Dalhousie should probably be altered slightly because hygienists also use the equipment in those schools. It is difficult to say what is the best ratio. Since acceptable instruction occurs in all of the schools, obviously a good deal of flexibility is possible, although the more limited the number of units, the more inflexible the clinical programme becomes. The Committee that prepared the recent report on Dental Education for the World Health Organization[1] considered that one unit and chair for every two students in the four-year programme is satisfactory.

At McGill University the undergraduate clinic is an outpatient department of the Montreal General Hospital and the administrative responsibility for the dental school is split between hospital and university. Over the years an excellent working arrangement has been developed between the two. The McGill staff feels that the varied hospital experience obtained by their dental students is an advantage of this system.

[1]World Health Organization: *Dental Education*. Report of an Expert Committee on Dental Health. Technical Report Series 244. Geneva: The Organization, 1962, p. 22.

TABLE 3–2

CLINICAL EQUIPMENT, CANADIAN DENTAL SCHOOLS, 1961–62

	Number of Dental Units	Student Capacity	Ratio Units: Students
Alberta	111	220	1:2.0
Manitoba	90	132	1:1.5
Toronto	300	500	1:1.7
McGill	44	160	1:3.6
Montreal	99	240	1:2.4
Dalhousie	39	100	1:2.5

All other schools defend the more conventional arrangement in this continent, and do not feel that the dental clinic should be administratively separated from the school to function as a hospital. They feel that dental students should obtain a good experience in a hospital dental clinic, but the general opinion is that the hospital clinic should not be the dental school clinic. The main justification offered for the more private dental school clinic is that it can function with emphasis on teaching rather than on service and patients can be selected or rejected on this basis.

Dental educators believe it is not possible to increase enrolment in the dental schools beyond the optimal class size for which they were constructed as shown in Table 3–1, without decreasing the quality of instruction. Furthermore the size of classes in any school should not be too large to jeopardize the advantage of personal contact between staff and students. The upper limit in class size should probably not be more than 100 and should preferably be less.

At the moment there are no immediate plans for major changes in teaching facilities in any of the established schools, although preliminary plans are being laid at both McGill and Montreal for new buildings. Increased space for research and for teaching auxiliaries is being added in other areas as well.

Some schools have long-range plans to increase enrolment dependent on the provision of new quarters or enlargement of existing structures. McGill would like to increase class size from 40 to 70 students, but would require a completely new school to do so. The University of Montreal would like to increase its enrolment from 60 to 80 or possibly 100 per year. As the only French language school in North America, Montreal performs a unique service in supplying virtually all the dentists for French Canada. The staff at Montreal feel that classes should not go beyond 100, and if the demand for French-speaking dentists goes beyond this a new school should be started in the Province of Quebec. Dalhousie staff was of the opinion that the demand for dentists in the Atlantic provinces might well require a class size of 60 students within the next decade.

With the new school established to serve British Columbia, the present facilities at the University of Alberta should permit graduation of a reasonable supply of dentists for the Province of Alberta for some time. Nearly 40 students from British Columbia were registered in the Alberta School in 1961-62 (Table 5–5)

and presumably this number will drop as the school at the University of British Columbia gets under way. Further relief for Alberta would also be forthcoming if a school were established in Saskatchewan, – the other major extra-provincial source of students in Alberta. Manitoba has plans for a class of dental hygienists but not for increasing dental student enrolment. Manitoba's ratio of dental students to population has improved since 1957-58 from being second lowest in the country to the highest. Enrolment at Toronto has almost reached its maximum. To provide additional dentists for Ontario it has been recommended[1] that a new school capable of graduating 60 dentists per year be established in that province.

If all these long-range plans come into fruition, and include a new Ontario school graduating 60 dentists per year, with the proposed class size of 40 at the University of British Columbia, a total of about 525 dentists could be graduated each year from the dental schools in Canada.

[1] *The Faculty of Dentistry, University of Toronto.* Brief submitted to the Royal Commission on Health Services. Toronto, May 1962, p. 10.

CHAPTER 4

STAFF

Discussions of the functions of a university repeatedly emphasize that the character and quality of the teaching staff is the most important factor determining the character and quality of the academic contribution of the university. Buildings may be new or old, adequate or inadequate, well or poorly equipped; money may be plentiful or scarce; still, teaching will be good or bad, research will really advance knowledge or will be but a sham, depending on the people doing the teaching and the research. A good academician will not become a poor one simply because of material inadequacy; nor will a poor academician become a good one simply because the building, equipment and money are there.

Dental schools have naturally relied largely on dentists to teach. Dental education in this country evolved out of preceptorships and the schools still employ a large number of practitioners on a part-time basis to teach clinical dentistry. The number of full-time staff is increasing as opportunities for worthwhile careers in academic dentistry multiply. Dental schools in general also rely to a high degree on the services of the staff of other university departments to teach many of the basic science subjects. As the dental staffs increase and more people with special training are employed, the schools will become less parasitic and more contributary in this respect.

The total number of academic staff employed in Canadian dental schools during the 1961–62 session is shown in Table 4–1. At present about 19 per cent of the staff are full-time, 5 per cent half-time, and 76 per cent are employed part-time. In 1926[1] only 9 per cent of the academic staff were employed full-time, 27 per cent half-time, and 64 per cent part-time. The present 391 academic personnel, together with about 170 full-time non-academic staff including nurses, secretaries, technicians, etc., are paid from the dental school budget. In addition there are perhaps a dozen technicians employed on research grants in the dental schools. There is, in the opinion of Canadian deans, an existing need for 80 full-time academic staff in all schools.

In the United States in 1958, 31.4 per cent of the staff of the dental schools were full-time teachers, and 68.6 per cent were part-time, compared with 18.7 and 81.3 per cent in Canada three years later. In 1958 the deans of the 47 U.S. schools

[1] Gies, W.J. *Dental Education in the United States and Canada*. Carnegie Foundation for the Advancement of Teaching. New York, 1926.

were of the opinion[1] that in the ideal faculty this ratio should be almost reversed that is, about 63 per cent of the staff should be full-time and 37 per cent part-time. Thus, the present Canadian ratio of full-time to part-time staff is considerably worse than in the United States, which also falls short of the ideal. If the Canadian schools could find and employ the 80 full-time teachers that are needed, and if there were a concomitant reduction in the number of part-time staff, the Canadian ratio of full-time to part-time staff would be about 40:60 – a considerable improvement, although still short of the ideal.

TABLE 4–1

ACADAMIC STAFF, CANADIAN DENTAL SCHOOLS, 1961–62

Type of Employment	Number	Per Cent
Full-time	73	18.7
Half-time	20	5.1
Part-time	298	76.2
Total	391	100.0

The ratio of full-and half-time staff to students enrolled in 1961-62 is shown in Table 4–2 for the Canadian schools. Half-time staff have been included since many persons so employed hold senior positions in the schools, and for purposes of calculation it was assumed that two half-time people were equivalent to one working full time. Without the half-time staff almost all ratios become worse and the Canadian average becomes 1:14.4 instead of 1:12.6. In the United States in 1958-59, the ratio of full-time staff to students was about 1:12.3. In Canada, if the additional 80 required full-time staff were employed, the ratio would be

TABLE 4–2

RATIO OF FULL- AND HALF-TIME STAFF TO STUDENTS ENROLLED, CANADIAN DENTAL SCHOOLS, 1961–62

School	Ratio Full- and Half-time[1] Staff to Students
Alberta	1:13.1
Manitoba	1: 4.6
Toronto	1:22.6
McGill	1:21.4
Montreal	1: 8.8
Dalhousie	1:10.0
Canadian Average	1:12.6

[1]Calculated on the basis that two half-time staff are equivalent to one full-time.

[1] Survey of Dentistry. *The Final Report.* Commission on the Survey of Dentistry in the United States. American Council on Education. Washington, D.C., 1961, p. 309.

1:7 or 8, comparable to that suggested by the World Health Organization Expert Committee on Dental Health.[1]

Manitoba has the lowest ratio in the country partly because during 1961-62 registration was only at about 70 per cent of capacity. This was not the only reason, however, because Alberta, Montreal and Dalhousie were all in a similar category. Of more importance, the establishment of the Manitoba school provides for a number of full-time basic science personnel to provide assistance for teaching these disciplines, and to carry out research in the school. If no further staff is employed, when this school reaches full enrolment the full- and half-time staff:student ratio will be about 1:6.6. It is of interest that Macdonald's[2] recommendations for the new school at the University of British Columbia called for a ratio of 1:5.4.

Comparing these staff:student ratios for the Canadian schools in 1961-62 with figures computed from the Gies report of 1926[3], only two of the five schools functioning both then and now show any real improvement. Two others show a very slight improvement and one has become somewhat worse.

ACADEMIC QUALIFICATIONS

Table 4–3 indicates the academic qualifications of the full-and part-time staff of the Canadian dental schools. More than half the full-time staff have formal training beyond the D.D.S. degree. About 28 per cent have specialist qualifications; 10 per cent have a Master's degree in a biological science; 8

TABLE 4–3

ACADEMIC QUALIFICATIONS, FULL- AND PART-TIME STAFF, CANADIAN DENTAL SCHOOLS, 1961–62

Qualification	Full-time Staff	Part-time Staff
	%	%
D.D.S. degree only	45.3	85.5
D.D.S. and Specialty (M.S. or Dip.)	28.0	10.7
D.D.S. and M.S. in Biological Science	10.7	0.6
D.D.S. Ph.D.	8.0	0.0
Other	8.0	3.2
	100.0	100.0

[1] World Health Organization: *Dental Education.* Report of an Expert Committee on Dental Health. Technical Report Series 244. Geneva: The Organization, 1962. p. 20.

[2] Macdonald, J.B. *Prospectus on Dental Education.* University of British Columbia, 1956.

[3] Gies, W.J. *Op. cit.*

per cent have a Ph.D.; and 8 per cent have other qualifications. As might be expected a very high percentage (85.5 per cent) of the part-time staff have no qualifications beyond the D.D.S. degree. About 10 per cent are specialists, and a few have other academic qualifications.

Half of those qualified beyond the dental degree obtained their graduate training in the United States; 40 per cent obtained it in Canada, and almost all the remainder were trained in Great Britain. The fact that most dental teachers with additional training received their graduate experience in the United States seems to have had no measurable influence on dental education in Canada. This is not unexpected since the pattern of dental education in the two countries is so similar.

While the pattern is different in Britain, there are probably too few British-trained dental teachers here to have had any noticeable impact on the Canadian system of dental education.

STAFF ACTIVITIES

The part-time dental teacher spends all of his teaching time in contact with students. He acts primarily as instructor and supervisor in the clinical phase of teaching. Some assist in pre-clinical instruction in one form or other, and a few hold senior positions in departments.

The activities of full-time staff vary a great deal from school to school. Some full-time appointments have been made in administration and some in research, but the latter are less common than the former. Certainly the staff spend much of their time on administration, in actual student contact, or in preparation for teaching, and relatively little on research. Generally those with the training and ability to do research have not sufficient time to do it, not because of any desire to suppress this activity, but rather because the serious shortage of full-time staff places the heavy work load on the shoulders of the few.

It is difficult, if not impossible, to decide arbitrarily an ideal ratio between teaching, administration, and research for full-time staff. This is so dependent on the past training and experience of the individual, and on his own inclinations, that no fixed rules can be made. The Commission on the Survey of Dentistry in the United States[1] felt that about one-quarter of the time of properly qualified staff should be free for research. On the average we fall far short of that in Canada.

STAFF REQUIREMENTS

Although the need is more acute in some areas than in others, all of the schools need more full-time staff. The immediate requirement is for an additional 80 full-time personnel, almost all of whom should have training beyond the regular undergraduate dental degree. There is less need at the moment for additional part-time staff.

Teacher requirements for the future will depend on the rate at which facilities are provided for increasing the dental population in Canada (Table 9–3). On the

[1] Survey of Dentistry. *The Final Report. Op. cit.*, p. 454.

basis of one teacher for each seven students enrolled[1], and assuming no new schools are provided, by 1971 the staff requirement would be 216 full-time teachers or half-time equivalents, and this number would remain constant. If a crash programme were embarked upon to provide a dentist:population ratio of about 1:1,600 by 1991, 450 teachers would be required by 1971, and this number would also remain constant. If facilities for dental education are expanded to graduate an additional 100 dentists per decade, about 270 teachers would be needed by 1971, 57 more each successive decade for a total of about 385 by 1991.

This present need together with forseeable future requirements for replacement and for new schools indicates a need for greatly expanded graduate programmes in the dental schools to train these future teachers. Unfortunately in some places graduate programmes cannot be started until at least some of the present staff requirements are met. While shortage of staff is not a unique problem for the universities,[2] the dental school does have some unique aspects to it. The dental staff will serve the school better if they have had experience in the practice of dentistry prior to entering study to become a teacher, particularly in a clinical field, but in others as well. In dentistry such experience can be obtained only in practice. Unless one is fortunate enough to be able to make arrangements to work with another dentist without capital outlay, a large debt is usually incurred. Following this the young man who aspires to a teaching career must sell his equipment, etc., and prepare to be supported financially by a modest fellowship if his training is of a basic research nature, or to support himself if his training is in a specialty. This together with the comparative unattractiveness of university salaries make recruitment of staff difficult, particulary in the clinical field. At the University of Montreal the problem is complicated by the fact that staff must be French speaking, which limits recruitment entirely to University of Montreal graduates.

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[1] World Health Organization: *Dental Education. Op. cit.*

[2] Bissell, C.T. *President's Report.* University of Toronto, 1961.

CHAPTER 5

STUDENTS

UNDERGRADUATE STUDENTS

Recruitment

It is not possible to obtain useful data on the number of applications for admission to dental schools in Canada over the last several years. Recording practices vary from university to university, and have changed even within individual universities. Thus, publication of available figures would confuse rather than clarify.

Obtaining a sufficient number of well-qualified applicants for admission to dental schools has been a problem of varying concern over the years. Immediately following the last war a large number of armed service veterans joined the ranks of applicants. Numbers dropped off during the latter part of the 1950's and appear to be on the way up again now. The current increase is undoubtedly related to the increasing numbers of students graduating from high school, although much of the interest in dentistry as a career is due to efforts by dentists both individually and more recently in an organized way to interest young people in this field.

The role of the individual dentist in encouraging recruitment is reflected in answers to the Survey of Dental Students recently conducted by the Canadian Dental Association.[1] About half the dental students enrolled in the schools during 1961-62 indicated that their dentist was the person who influenced their choice of dentistry as a career. The next most frequently mentioned person influencing career choice was the parent or relative of the applicant.

Within recent years action has been taken by the Canadian Dental Association to ensure that recruitment activities of the profession are not left to chance. At the 1960 meeting of the Board of Governors[2] the Council on Education was instructed to set up a special National Recruitment Committee to "study all aspects of recruitment of dental students", with a view to increasing the number of qualified applicants to the dental schools. The willingness on the part of

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[1] Canadian Dental Association: *Survey of Dental Students, 1962.*

[2] Canadian Dental Association: *Transactions, 1960,* p. 9.

dentists to assist in recruitment is reflected in replies to a national survey of Canadian dentists by the committee to determine professional attitudes to recruitment. On the basis of a 55 per cent return on the survey, 91 per cent of dentists believe that there is a general national shortage of dentists and 82 per cent are willing to encourage young people to consider dentistry as a career.[1]

In part at least because of the efforts of the profession, there has been an increase in interest in dentistry as a career over the past year or two. Between 1960 and 1961 the number of applications to Canadian dental schools increased by more than 45 per cent.[2] This increase in the number of applicants will be reflected in an increase in the general academic quality of dental students. P.J. Stoy[3] recently compared academic performance of medical and dental students in Northern Ireland. He concluded that the average of 5 per cent higher marks of medical students was due to better selection of medical entrants at the time of admission, made possible because of the relatively larger numbers applying for permission to enter medical school. The present increase in applications to Canadian dental schools should help fulfil the objective of dental educators to graduate not simply the maximum number of reasonably well-trained individuals, but to graduate the maximum number of well-trained individuals of the highest possible intelligence.

Selection

Increase in the number of applicants without increasing enrolment numbers creates the problem of choosing from so many, those best qualified to enter a course in dentistry. The number of applicants with at least minumum qualifications has risen to three or four for each vacancy in some schools, and it becomes increasingly important to be able to select accurately those with the greatest potential and to reject the others. Selection methods are therefore coming under closer scrutiny.

In general the two main criteria for acceptance into any dental school in Canada are past academic performance and residence, in that order. Past academic record is probably the best single factor for predicting potential performance. Each of the schools, however, has an economic and moral responsibility to its home province for the provision of dental service. Once basic academic qualifications are satisfied, local loyalty influences acceptance. The Alberta and Manitoba schools have a prime geographic interest in students from their own provinces, and then in applicants from elsewhere in western Canada. In Toronto, Ontario students get preference, and here an effort is also made to have as great a representation as possible of students from rural areas without in any way sacrificing quality. McGill's loyalty is to the City of Montreal and then to other areas in the Province of Quebec. The geographic origins of students

[1] Canadian Dental Association: "Survey of Dentists' Attitudes Toward Recruitment". *J. Canad. D.A.*, 27 (12): 799–807, 1961.

[2] Canadian Dental Association: *Transactions, 1962*, p. 47.

[3] Stoy, P.J. "Medical and Dental Students – a Comparison". *Brit. Dent. Jour.*, 98:356, 1955.

at the University of Montreal are largely dictated by the fact that teaching in that school is in the French language; understandably almost all of their applicants are from the Province of Quebec. Dalhousie is concerned with training dentists for the Atlantic Provinces.

Having satisfied themselves that the basic academic qualifications have been met and geographic responsibility satisfied – with the present number of applicants there is no problem in satisfying both of these criteria – then admission committees must try to select the best among those equally well-qualified academically. To help make the correct choice aptitude tests have been employed. It is rightly assumed that past academic performance is a good measure of the potential ability of a student to learn the academic subjects in the dental curriculum, but this is of little value in predicting digital skills. And with digital performance playing a prominent role in determining the success or failure of a dental student, it is necessary to evaluate applicants' potential mechanical skills.

For a number of years the American Dental Association has tested dental applicants for digital aptitude and this test is very widely used in the United States. In Canada a study on student selection is presently under way at the University of Toronto.[1] Such a study is of necessity a long-term investigation and it will be some time before final conclusions can be drawn.

The unreliability of selection methods has been recognized by the Expert Committee on Dental Health of the World Health Organization.[2]

Difficulties in developing and using selection formulae include the lack of correlation between academic and technical achievement, the strong shift in emphasis from academic to technical performance in the dental curriculum from the first to the final year (see Table 6–1), and the subjective nature and unreliability of examinations in the dental school particularly in the clinical areas. Grainger and Flowers have pointed out that unless supplemented with special tests high school grades are of little use in predicting technical aptitude. Since studies to date indicate that the student who is well-qualified academically can acquire mechanical aptitude far more successfully than the solely technically able student can become a scholar, selection on the basis of past academic performance is still the most certain. It seems clear, however, that as competition for space continues to increase, more refinement in the methods for selecting the best applicants will be necessary.

Characteristics of Dental Students

About 95 per cent of dental students in Canada are male (Table 5-4) and the average age of those entering the first year of the course is 21. More than half come from families where the father is in a profession, owns his own business,

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[1] Grainger, R.M., and Flowers, J.F. *Aptitude Tests. Report to the Council on Dental Education of the Canadian Dental Association.* March 1962.

[2] World Health Organization: *Dental Education.* Report of an Expert Committee on Dental Health. Technical Report Series 244. Geneva: The Organization, 1962, p. 16.

or is a manager or executive. About 12 per cent of parents of dental students are physicians or dentists (Table 5–1). About half the students come from families where the annual income of the parents is more than $6,000, and about one-fifth are from families whose annual income is more than $10,000, with a similar number from families where annual income is less than $4,000 (Table 5–2). Most dental students come from large municipalities. Fifty-two per cent are from cities greater than 100,000, 27 per cent from communities of less than 10,000 in rural areas, and the balance (21 per cent) from communities between 10,000 and 100,000 in size. This compares with a general population distribution of 25 per cent, 57 per cent and 18 per cent for the same respective areas (Table 5–3).

TABLE 5–1

OCCUPATION OF PARENT, CANADIAN DENTAL STUDENTS, AND DISTRIBUTION OF MALE POPULATION OF CANADA BY OCCUPATION

Occupation	Per Cent of Students[1]		Male Population[2]	
Professional — Physician or Surgeon	6.8		0.4	
Dentist	4.9		0.1	
Engineer or Architect	2.6		1.0	
Pharmacist	0.7		0.1	
Lawyer	0.7		0.3	
Accountant	1.5		0.6	
Professor	0.4		0.2	
Teacher	2.9		1.2	
Clergyman	1.0		0.4	
Other	1.3		3.4	
		22.8		7.7
Manager, Official or Executive	10.7		10.5	
Owner of Business	22.8		—	
		33.5		10.5
Miscellaneous — Commercial or Financial	4.0			
Clerical	2.4		7.1	
Agricultural	7.8		12.5	
Manufacturing	6.3		29.6	
Construction	2.2			
Transport	2.5		7.7	
Personal Service	0.9		4.5	
Other Service	1.0		4.3	
Labourer	3.9		6.4	
Other	12.7		9.7	
		43.7		81.8
		100.0%		100.0%

[1]Canadian Dental Association, *Survey of Dental Students, 1962.*

[2]Dominion Bureau of Statistics, "Labour Force, Occupation by sex", Census of Canada 1961.

Results of studies of the reasons why students enter dentistry both in Canada and the United States are, not surprisingly, quite similar. In both countries available data are based on answers to questionnaires submitted to dental students and answers to "Why I entered dentistry as a career" are of necessity

limited to the choice of answers provided by those who designed the questionnaire. On this basis most dental students evidently enter dentistry primarily because of an interest in the things dentists do in order to make a living. They have a strong desire to be independent and do not want to work under the direction of someone else. Dental students have a desire to perform a service for people and they want

TABLE 5–2

ANNUAL INCOME OF PARENTS, CANADIAN DENTAL STUDENTS, 1962, AND DISTRIBUTION OF CANADIAN TAXPAYERS BY INCOME, 1960

Approximate Income	Per Cent of Students[1]		Canadian Taxpayers[2]	
Over $20,000	3.6		0.7	
$15,000 – $20,000	5.1		0.6	
$10,000 – $15,000	11.8		2.0	
		20.5		3.3
$8,000 – $10,000	12.1		2.6	
$6,000 – $8,000	16.9		7.9	
		29.0		10.5
$4,000 – $6,000	27.8		28.6	
Under $4,000	22.7		57.6	
		50.5		86.2
		100.0%		100.0%

[1]Canadian Dental Association, *Survey of Dental Students, 1962.*

[2]Department of National Revenue, *Taxation Statistics, 1962.*

TABLE 5–3

DISTRIBUTION OF CANADIAN DENTAL STUDENTS BY SIZE OF HOME TOWN COMPARED WITH GENERAL POPULATION DISTRIBUTION

Size of Home Town	Dental Students[1]	General Population[2]
	%	%
Greater than 100,000	52	43.4
10,000 – 100,000	21	15.1
Less than 10,000	27	11.1
Rural		30.4
	100	100.0

[1]Canadian Dental Association, *Survey of Dental Students, 1962.*

[2]Dominion Bureau of Statistics, *Census of Canada 1961,* Catalogue 92–536 (Vol.1 part 1).

to be able to use their hands to do it. They enjoy working with people, and they envy the prestige that dentists enjoy in the community and wish to share it. They are realistic enough to realize that dentistry offers a potentially good living with reasonable working hours and security.[1]

[1] Canadian Dental Association: *Survey of Dental Students, 1962.*

Most dental students apparently make up their minds to enter dentistry while they are quite young.[1] Almost 20 per cent of those registered in 1962 had chosen to enter dentistry before they had passed their early high school years, and more than 50 per cent had made up their minds before graduation from high school.

Enrolment

The number of undergraduate dental students currently enrolled in the dental schools in Canada is shown in Table 5–4, together with maximum class size for each school. The difference between the total number of spaces available (338 per year) and the number of students actually enrolled is due chiefly to the fact that the class sizes have enlarged in a number of schools very recently, and enrolment has not yet climbed to full capacity. This must occur over a four-year period. Thus, fourth year enrolment is low, although first year is almost at its maximum. With maximum numbers continuing to enter the schools all classes will soon be full.

The number of female dental students in 1961-62 was about 4 per cent of the total (Table 5–4). This compares with about 10 per cent in the United States[2], and with 10 to 17 per cent in Great Britain.[3,4,5] In Norway, Sweden, Finland and Denmark the percentages of female dental students were 30, 30, 40 and 75 per cent respectively for 1956.[3] The number of women admitted to British dental schools increased from about 11 per cent to slightly more than 17 per cent between 1951 and 1955.[4] The U.S. Commission on the Survey of Dentistry[6] was of the opinion

TABLE 5–4

UNDERGRADUATE ENROLMENT, CANADIAN DENTAL SCHOOLS, 1961–62

School	Maximum Class Size	Year				Total
		I	II	III	IV	
Alberta	55	50	44	33	30	157
Manitoba	33	31	26	20	15	92
Toronto	125	120	110	114	85	429
McGill	40	39	33	31	36	139
Montreal	60	60	27	39	45	171
Dalhousie	25	18	13	14	15	60
Total	338	318	253	251	226	1,048
Per Cent Female		2.8	4.7	2.8	4.4	3.6

[1] Canadian Dental Association: Survey of Dental Students, 1962.

[2] American Dental Association: *Dental Students' Register, 1961-62.*

[3] *Report of the Committee on Recruitment to the Dental Profession.* London: H.M. Stationery Office, Cmd. 9861. October 1956.

[4] Stones, H.H., and Lawton, F.E. "Dental Education in the United Kingdom". *Internat. D.J.*, 6: 416–430, 1956.

[5] MacGregor, A.B. "The New Birmingham Dental School". *Brit. Dent. Jour.*, 111:145–149, 1961.

[6] Survey of Dentistry. *The Final Report.* Commission on the Survey of Dentistry in the United States. American Council on Education. Washington, D.C., 1961, p. 282.

that more women should be recruited into dentistry in the United States. They pointed out that there is no reason to believe that women would not be as competent as men in the practice of dentistry as it is known today. By tradition, however, dentistry on this continent as on some others, has been a male domain. While many women dentists have continued to practise at least part time, the relative quantity of dental service rendered by male dentists during their lifetime of practice is higher on the average than for females. There seems to be no reason to believe that the ratio of male to female students in dental schools on this

TABLE 5–5

RESIDENCE OF UNDERGRADUATE DENTAL STUDENTS, CANADIAN DENTAL SCHOOLS, 1961–62

Residence	Dental School						Total
	Alberta	Manitoba	Toronto	McGill	Montreal	Dalhousie	
British Columbia	36	6	6	7		2	57
Alberta	86						86
Saskatchewan	29	12	2	3	1		47
Manitoba	1	68	3	1		1	74
Ontario	1	2	395	7	3	2	410
Quebec		2	3	62	156	2	225
New Brunswick					2	12	14
Nova Scotia				1		19	20
Prince Edward Island						2	2
Newfoundland			1			7	8
Total Canada	153	90	410	81	162	47	943
United States of America	1		8	37	5	6	57
Great Britain			7	2		1	10
Australia			1			1	2
Bermuda				2		2	4
British Guiana				2			2
Ghana	2						2
Haiti			1				1
Hong Kong		1		2		2	5
India			1				1
Nigeria	1						1
Singapore		1					1
Trinidad						1	1
West Indies			1	12			13
Europe				1	4		5
Total Other Countries	4	2	19	58	9	13	105
Total	157	92	429	139	171	60	1,048

Modified from Canadian Dental Association, *Dental Students' Register*, 1961-62.

continent is likely to change materially in the next few years. As more facilities for training dentists become available in Canada, the number of qualified male applicants may be insufficient to meet future needs. In this case special recruitment efforts may be necessary to interest more young women in a career in dentistry.

Enrolment of undergraduates in Canadian dental schools during 1961-62 is shown in Table 5–5 according to home province or home country. Of the total of 1,048 students registered, 943 were from Canada and 105 from outside Canada. More than half the latter were from the United States, with most of these registered in one school. Other than U.S. students, most foreign students are from the British Commonwealth.

Students from British Columbia tend to go to the nearest dental school, in Alberta, although an appreciable number attend other schools even as far away as Dalhousie. A number of British Columbia students also attend schools in the United States, mostly at nearby universities at Oregon and Washington.[1] Most students from Saskatchewan attend the Alberta and Manitoba schools. Enrolment numbers at Dalhousie reflect the service this school renders the Atlantic Provinces.

In 1961-62 while 57 students from the United States were studying in Canada, as shown in Table 5–5, 29 Canadian students were attending U.S. dental schools. Twenty of these were from the Western Provinces and nine from Ontario.[2]

Loss of Students Per Year

Loss of first-year dental students from the class which began its studies in 1960-61 is shown in Table 5–6. A total of 30 students, or 11.1 per cent of the original class dropped out and of these most were failed. The loss of students diminishes as classes advance. During the same session about 7 per cent of second-year students failed to advance to third year, and 5 per cent of third-year students and one or two fourth-year students were also lost.

This wastage of first-year students does not seem to change greatly in the dental schools over the years, and compares with the failure rate of 9.1 per cent of first-year medical students in 1959-60.[3]

Why the failure rate at the first-year level in these professional schools continues to hover around 10 per cent is difficult to understand. Perhaps it simply reflects the inadequacy of methods of selection in the face of so many intangibles. On the other hand as applications increase and competition for space in the schools increases a greater number of students entering first year will have higher pre-dental grades. In theory then, the failure rate should drop provided examination procedures are standardized from year to year. Since there has been no indication of a drop in failure rate as yet, presumably the examinations are getting more severe, or they are being marked more critically. Standardized examinations are very difficult to arrange in a course like dentistry, particularly

[1] American Dental Association: *Dental Students' Register, 1961-62.*

[2] American Dental Association, *Dental Students' Register,* 1961-62.

[3] Thompson, J.S. "Wanted: More and Better Medical Students". *Canad. Med. Assoc. J., 84:689–691, 1961.*

in the clinical areas where marks for individual operations must be quite subjective. On the other hand, if the number of spaces in dental schools increases, then the proportion of entering students with higher pre-dental grades will not necessarily increase. We shall then presumably be faced with this continuing and common loss of about 10 per cent at the end of the first year.

In any case, despite past academic performance or the efficiency of aptitude testing programmes, there will always be some who for a variety of reasons will withdraw after a taste of dental education. Some will find that they are not particularly well suited for a career in dentistry despite test results; some will experience more difficulty in studying in the university environment than high school or college results would indicate; and some may become disillusioned when they find the course differs from their preconceptions.

In view of a general average loss of about 10 per cent at the end of the first dental year, consideration has been given to enrolling enough dental students in first year to compensate for the expected loss in registration at the beginning of the second year. In dental schools, however, the loss is often compensated for by admitting students with special qualifications to advanced standing. Some schools admit graduates of certain foreign schools to second year, provided reasonable grades are obtained in a qualifying examination.

TABLE 5–6

WASTAGE OF FIRST-YEAR STUDENTS, CANADIAN DENTAL SCHOOLS, 1960–61

School	Loss		Reason		
	No.	%	Fail	Transfer	Other
Alberta	2	4.3	6	2	
Manitoba	6	21.4	6		
Toronto	7	6.2	7		
McGill	4	10.8	4		
Montreal	9	27.3	7	2	
Dalhousie	2	15.4			2
Total	30	11.1	24	4	2

Source: Canadian Dental Association, *Dental Students' Register, 1961–62.*

Graduates with the Bachelor of Dental Surgery degree from some Commonwealth dental schools are sometimes admitted directly to the fourth dental year although this is not a prerequisite for licensure in all provinces. Such admissions tend to compensate for first-year wastage as may be seen from Table 5–7. Between 1950 and 1959 only two classes sustained a loss of about 10 per cent. For the others the loss did not exceed 5 per cent, and in three classes an increase in size occurred.

TABLE 5–7

CHANGES IN ENROLMENT IN INDIVIDUAL CLASSES, FIRST THROUGH FOURTH YEAR, CANADIAN DENTAL SCHOOLS, 1950–1961

Year of Enrolment	Number of Students				Change 1st to 4th Year	
	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	No.	%
1950–51	175	168	160	174	−1	−0.5
1951–52	173	174	166	180	+7	+4.0
1952–53	172	173	163	176	+4	+2.3
1953–54	194	194	185	185	−9	−4.6
1954–55	211	209	202	203	−8	−3.8
1955–56	199	192	192	190	−9	−4.5
1956–57	206	198	203	222	+16	+7.8
1957–58	194	181	169	179	−15	−7.7
1958–59	250	236	217	226	−24	−9.6
1959–60	279	250	251			
1960–61	268	255				
1961–62	318					

Source: Canadian Dental Association.

Number of Graduates Versus Potential

With the space in first year almost full (Table 5–4) and with no lack of applicants, it may be assumed that within two or three years the Canadian dental schools will be operating at close to maximum capacity. To try to increase enrolment beyond that for which the schools were designed would be a mistake that would impose unwarranted hardship on an already overloaded staff and seriously jeopardize the quality of teaching.

From the standpoint of rendering the maximum public service, schools receiving less than enough qualified applicants might well consider surplus applicants from other areas. This would require a suitable inter-provincial financial adjustment.

Placement After Graduation

In the recent survey of undergraduate dental students by the Canadian Dental Association[1] students were asked to indicate the province and city in which they intended to practise. At the same time in another survey, dental graduates of the last 10 years were asked to state location of practice.[2] Students replies have been compared with the actual location of practice of the recent graduates in Table 5–8. Assuming the graduates would have given similar answers to an undergraduate questionnaire when they were in school, some useful observations can be made. Three-quarters of the undergraduates had decided the province in which they intended to practise, and two-thirds indicated their intention to work in their home

[1] Canadian Dental Association: *Survey of Dental Students, 1962.*

[2] Canadian Dental Association: *Survey of Recent Graduates, 1962.*

province. Of the one-quarter who had not made up their minds, most eventually decide to go home, and the rest practise in another province. About 80 per cent of the graduates of the last ten years practise in their home provinces.

Sixty per cent of graduates practise in their home city or district, although only 47 per cent of undergraduate students indicated that they had made up their minds to do so. Thus of the 20 per cent of undergraduates who are undecided as to what city or district they will practise in, most apparently go home.

Foreign Students

About 10 per cent of all students registered in 1961-62 were from outside Canada and more than half of these were from the United States (Table 5–5). No data are available to indicate how many of the foreign students attending dental schools in Canada stay after graduation, although it is probably reasonable to assume that a high percentage go back to their home countries.

TABLE 5–8

COMPARISON OF QUESTIONNAIRE REPLIES FROM UNDERGRADUATE DENTAL STUDENTS AND RECENT GRADUATES REGARDING LOCATION OF PRACTICE, 1962

Undergraduates[1]		Recent Graduates[2]
Province Where Intend to Practise		Province Practising In
	%	%
Province of residence	66.3	80.5 — Province of residence before school
Province where school is	3.5	4.9 — Province where went to school
Another province	4.3	14.6 — Another province
Undecided	25.9	
City Where Intend to Practise		City Practising In
Home town	31.6	42.7 — Home town
Home district	15.2	18.8 — Home district
City in which school located	6.0	6.5 — City in which school located
Another city	27.0	32.7 — Another City
Undecided	20.2	

[1]Canadian Dental Association, *Survey of Dental Students, 1962.*

[2]Canadian Dental Association, *Survey of Recent Graduates, 1962.*

Most of the students from Great Britain and Australia had the B.D.S. degree from their home country at the time of admission to dental school here and were permitted to enter the final year; other foreign students were admitted as regular undergraduate students. Excepting those from the United States, the balance (about 4 per cent) represents the contribution of the dental schools toward Canada's obligation to provide facilities and opportunities for training people from countries where such opportunities do not exist. Contact with these people, whose philosophy and background may differ so much from that of the average Canadian

undergraduate, can be a rewarding experience. The need to increase these opportunities has been emphasized by the World Health Organization's Expert Committee on Dental Health.[1]

Financing

The cost of education to the dental student is now higher than any other in the university.[2] Extimated pre-dental expenses in 1961-62 averaged about $2,000 (Table 5–9), and ranged between $990 and $3,350 depending on the school. The cost of the four years of training in the dental school averaged almost $3,600 for university fees, books, instruments, etc., and about $3,000 for board and room, for a total average cost of just over $6,600 (Table 5–9).

TABLE 5–9

ESTIMATED AVERAGE COST TO STUDENTS, DENTAL EDUCATION IN CANADA, 1961–62

Item	Average Cost	
Pre-dental		
Tuition	$572	
Textbooks	92	
Supplies	33	
Incidentals	75	
Sub-total – University expenditure	772	
Room and Board	1,164	
Total Pre-dental		$1,936
Dental		
Tuition	$1,900	
Instruments, Books, Supplies, etc.	1,680	
Sub-total – University expenditure	3,580	
Room and Board	3,043	
Total Dental		$6,623
GRAND TOTAL		$8,559

Modified after Canadian Dental Association, *Dental Students' Register, 1961–62.*

Estimates for university expenses vary from $3,150 to $4,000, and board and room from $2,340 to $5,000.

Thus the total cost of both pre-dental and dental training was, on the average, $4,325 for fees, books, etc., and $4,207 for room and board, for a total of $8,559. The total varies from a low of $6,548 to a high of $11,750. In the United States in 1958-59 it was estimated that on the average dental education cost a student $13,260 for the four-year dental course.[3]

[1] World Health Organization: *Dental Education. Op. cit.*, p. 27.

[2] Canadian Dental Association: *Dental Economics News Letter.* Vol. No. 1, Dec. 1962.

[3] Survey of Dentistry. *The Final Report. Op. cit.*, p. 375.

With such high costs it is not surprising that a high percentage of dental students seek financial assistance, and various scholarships, bursaries, student loans, are available in all schools. Regular scholarships and bursaries are granted without commitment on the part of the student. Recently some special provincial bursaries have been made available. They are awarded on condition that recipients serve a minimum time after graduation in a location specified by the provincial health minister. Student loans carry no interest before graduation and a low rate following. In addition since 1948 the Department of National Defence has offered complete subsidization to dental students provisional upon serving a predetermined period of time after graduation as an officer in the dental corps. Since the latter programme was begun 257 candidates have enrolled, of whom 64.2 per cent returned to regular dental practice once the term of compulsory service had been served. For most of Canada about 85–90 per cent of these return to their home provinces, although only 54 per cent from the Atlantic Provinces have done so.[1]

The number of students receiving financial assistance in one form or other varies considerably from province to province. At Alberta for example 71 per cent of students obtain some help, 18 per cent complete subsidization and 53 per cent partial. At Toronto and McGill about 43 per cent of students obtained assistance. In Toronto dentistry has the highest percentage of students getting help of any faculty, and the amount per student aided is higher.

POSTGRADUATE AND GRADUATE STUDENTS

Limited opportunities for postgraduate and graduate study are available in the dental schools in Canada (Table 5–10), and these are discussed more fully in another section of this report. Types of opportunities vary and include study in individual subjects part-time as an occasional student, concentrated refresher courses extending over several days, courses leading to certification in one of the specialties in dentistry, and programmes leading to the Master of Science or Doctor of Philosophy degree in one of the basic sciences related to dentistry.

Efforts to recruit postgraduate and graduate students in dentistry are small or almost non-existent, particularly when compared to efforts in the undergraduate field. Recruitment for the limited programmes available has not been a serious problem, although one can anticipate that as facilities for training increase, recruitment efforts will have to be stepped up at least in some areas. Programmes to recruit candidates at the graduate level do exist in research. Funds are available through both the Canadian Dental Association and the National Research Council of Canada to assist promising undergraduates to gain experience in a research laboratory during the summer, with a view to stimulating interest in a research career.

[1] Baird, K.M. "Recruitment of Dental Students Through Subsidization". *J. Canad. D.A.*, 27:642–644, 1961.

TABLE 5–10

POSTGRADUATE AND GRADUATE STUDENTS ENROLLED, CANADIAN DENTAL SCHOOLS, 1961–62

School	Type of Programme					Total
	Refresher	Special[1]	Specialty		Basic Science Degree	
			Diploma	M.S. Degree		
Alberta	55					55
Manitoba			1			1
Toronto	79	5	20		5	109
McGill		1				1
Montreal			6	3		9
Dalhousie						
Total	134	6	27	3	5	175

[1]Students registered full- or part-time, undertaking studies not leading to a degree or diploma.

Interest in the specialties varies, and in spite of the fact that so few courses exist in Canada, some are short of qualified applicants, while others consistently have more than can be accepted. A number of Canadian dentists are accepted into specialty training in the United States where a greater variety of programmes is available and where financial subsidization is often possible.

Selection of candidates for postgraduate and graduate programmes is similar to that for undergraduates. The prime requisite is high scholastic standing based on past academic performance. Where detail of academic background is not readily available as happens with many overseas candidates, acceptability may be on a trial basis. Enrolment in a regular programme may follow establishment of academic capability. Admission committees are also cognizant of the varying need for specialists in Canada and bear this in mind when selection is being made. Selection is more difficult in those areas where the number of qualified applicants exceeds the number of openings in the course. For example, at the University of Toronto the four to six candidates chosen each year in orthodontics are selected from perhaps forty applications.

For candidates undertaking a programme leading to a career in research, selection is influenced heavily by the decision of the sponsor who will guide the candidate in his research.

In 1961-62 two schools presented a series of postgraduate refresher courses; three offered courses leading to specialist certification; and three offered programmes leading to advanced qualification in basic sciences. All schools are cognizant of the need to expand opportunities for postgraduate and graduate study, and almost all are hindered in expansion by lack of space and properly qualified staff.

The number enrolled in graduate and postgraduate study in Canadian dental schools in 1961-62 is shown in Table 5–10. A total of 175 dentists took formal training of some sort in the schools that year. Of these 134 took refresher courses and 6 were registered in special individual programmes. Thirty dentists were undergoing training leading to specialist certification including three who were in a programme leading to the master's degree. There were five candidates enrolled in the programme leading to a master's degree in a basic science discipline.

The residential distribution of postgraduate and graduate students is shown in Table 5–10. Almost all those enrolled in refresher courses came from the province in which the school was located and many were from the city or district in which the school was located. The costs of such training are particularly high for those located some distance from the school because the cost of travel and subsistence must be added to the regular fee. These expenses are not deductible for income tax purposes.

TABLE 5–11

RESIDENTIAL DISTRIBUTION, POSTGRADUATE AND GRADUATE STUDENTS, CANADIAN DENTAL SCHOOLS, 1961–62

Residence	Number	
	Including "Refresher"	Not Including "Refresher"
Canada		
Province in which school is located	146	27
Other province	7	5
Foreign	22[1]	9[2]
	175	41

[1]Includes 13 U.S.A.
[2]Includes 2 U.S.A.

About 22 per cent of the remaining postgraduate and graduate students came from outside Canada, most from outside North America. Although limited in magnitude, this contribution of the Canadian schools to the training of students from overseas, and in particular from Colombo Plan countries, is of great significance.

Candidates on courses leading to specialist certification are eligible for loans and bursaries to help finance their programmes. Fellowships are not available to help support those doing advanced training in a clinical field of dentistry. Fellowships are available however, through both the Canadian Dental Association and the National Research Council of Canada for individuals taking programmes leading to an advanced degree in a basic science. The extent of this support since 1948 is shown in table 7–1.

CHAPTER 6

CURRICULUM

"Perhaps the most stable element in the uncertain future of this country of ours is change itself, change so rapid in the scientific, technological and social fields that our world will resemble the woods in which poor Alice found herself. There, according to the Red Queen, to stay in the same place one must run at top speed and in order to get anywhere else one must run twice as fast. In our rapidly evolving era, education like Alice must run twice as fast as it is now doing if it is to get anywhere."[1]

A. UNDERGRADUATE CURRICULUM

During the past thirty years on this continent scientific, technological, economic and social change has occurred faster than ever before, yet during the same period the dental school curriculum has remained remarkably unchanged. Many criticisms have been levelled at the curriculum during this period and suggestions made for modifications, but as Table 6–2 shows, little has resulted.

It could be argued, of course, that the stability of the dental curriculum reflects the fact that it has been meeting the present objectives of dental education, and one would have to agree that it has. Perhaps we have not been looking deeply enough. The time has come for a serious re-evaluation of the objectives of dental education. Are objectives that were well suited to the past equally well suited to the future? Can dental schools today afford the luxury of doing the same basic job required of them thirty years ago?

The recurring problem of dental education is to develop fully the minds and vision of dental students. Within the same short four-year period, the students must also gain sufficient technical skill, clinical knowledge and experience to be able to work safely and independently, and to diagnose and treat the multitude of ills for which they will be responsible after graduation. These two basic purposes tend to throttle each other – the one ideally requiring few assignments, considerable free time to read and think, and long vacation periods, and the other demanding more assignments, with shorter summer periods,

[1] Chase, Mary Evans. Director of Admissions, Wellesley College. *New York Times Magazine*, November 29, 1959.

and longer academic years. It is not the teaching of science, of medicine, or of the principles of treatment that causes frustration. Scientific and biological disciplines can be just as mentally stimulating and broadening as any other; it is the necessary drill, the repetition required for learning digital skills, that throttles the academic purpose.

Is dentistry really, as Burkett[1] has written "... enjoying the complacency of travelling the educational by-ways in a horse and buggy while the rest of the world is keyed to travel by the super highway and the jet plane"? He went on to say "Planned, intelligent, and indeed courageous experimentation in dental education is in order. No attempt should be made to educate dental students to be physicians and surgeons of the oral cavity, and also dental technicians". Yet this is precisely what we are trying to do. Ideally Burkett felt that "Every part of the curriculum must justify its existence in respect to the desired objective – the development and education of scholars for the practise of dentistry, research, or teaching, who will be respected members of society.....". In Macdonald's report on dental education for British Columbia[2] he recommeded "..... ruthless pruning of all that does not contribute to the main objective of the (dental school) program" and noted that to do this requires acceptance of very definitely defined objectives.

Objectives

There seems to be quite general agreement that there are three basic purposes that the dental curriculum should meet:

1. to provide students who have the necessary background of knowledge and intellectual ability with the basic knowledge, skills, and experience that will be required to fit them to conduct a general practice of dentistry upon graduation:
2. to impart to students the high standards of conduct and of ethical and moral behaviour that should be inherent in those who enjoy professional status in the community;
3. to teach a sufficient background of basic scientific and clinical knowledge that graduates are prepared to continue in further graduate study, and are stimulated to do so. That is, graduates should have a desire to keep informed of changes, not only in professional and scientific disciplines, but in the world around them, and they should be equipped to adapt to changes as they occur.

Does the dental curriculum do all this? If it does not, where does the failure lie?

With regard to the first objective, no one will quarrel with the basic quality of the graduates from Canadian dental schools. They are skilled and knowledgeable in their work and are well fitted to enter the type of dental practice operating today. In general, the quality of dental treatment being provided in Canada is

[1] Burkett, L.W. "Changing Dimensions in Dental Education." *Jour. Dent. Ed.*, 23:81–88, 1959.

[2] Macdonald, J.B. *Prospectus on Dental Education.* University of British Columbia, 1956, p. 31.

high, and the men and women who graduated from Canadian dental schools are responsible for this. This standard of clinical excellence has not been achieved without sacrifice. Clinical skills and experience cannot be obtained overnight; as Table 6–1 indicates, more than half the entire dental course is devoted to the acquisition of these skills. This is a justifiable expenditure of time if this be the prime purpose of dental education, but it leaves little time for the teaching of other things of perhaps equal or even greater importance in the long run.

A very small part of the curriculum time is spent in formal discussion of standards of moral, ethical and professional behaviour and responsibility – not more than a small fraction of 1 per cent of the time in any one year. These things are not really learned from a lecture or textbook in any case. Much of a student's basic sense of responsibility should be ingrained in him before he ever enters the university; the rest he learns largely from the example of his instructors and from practical experience in school. The opportunity to acquire a sense of social responsibility and a high standard of professional relationship to patients is one of the strengths in the system of dental education in Great Britain. There the school dental clinics function as out-patient departments of hospitals, with treatment being supplied largely by students of the dental school. The dentist's responsibility to the patient is ingrained into the British dental student from the beginning under this environment. As Rushton[1] has pointed out however, these clinical demands on students' time interfere with dentistry as a true university discipline, and care must be taken to avoid exploitation of the student as cheap labour to the detriment of his real education.

In Canada, while emergency service is provided by the dental school clinics, no attempt is or can be made to supply a mass service for all who apply. Cases for student treatment are carefully selected on the basis of their value in providing useful experience for the students. Thus, in this country some of the sense of responsibility to the sick is sacrificed for the sake of providing the most ideal cases for teaching in the schools.

Probably there is more reason to question whether the dental curriculum is satisfying the third objective listed. There is certainly more doubt as to whether dental students are really stimulated to continue as students, not only in the dental field but in others as well, than there is about their ability to perform dental service, or about their moral and ethical standards. The dental curriculum seldom provides sufficient academic background for the dental graduate seeking advanced training not to be handicapped by an inadequate basic science experience. Generally he must go back to take work he should have covered as an undergraduate. All too frequently the basic science courses for the dental students are "little courses", almost but not quite complete, designed with the idea that dental students do not require as much science background as a prerequisite for dealing with oral health as medical students require for dealing with general health. This is not to say that basic courses for dental and medical students should be identical, but surely they should be

[1] Rushton, M.A. "Dentistry and the Universities." *Brit. Dent. Jour.*, 108:64–69, 1960.

equivalent to one another. In some instances they are becoming equivalent, but there still remains a significant gap between the two in most cases.

Dentists are not remarkable for their enthusiasm for formal postgraduate instruction. As Table 5–11 shows, in 1961-62 just over 150 of approximately 6,000 dentists in Canada attended courses of instruction in Canadian dental schools. Some also attended courses in the United States, but most seemed to depend on local dental society meetings or conventions to keep them up to date. Almost one-fifth of the dentists in Ontario attended thirteen lectures presented by the staff of the Ontario dental school through an extramural lecture programme from May 1 to December 31, 1961.[1]

In defence of those who do not attend the longer formal courses in Canada, opportunities are relatively few. There are only six schools where such courses could be presented, and not all of these have facilities or sufficient staff to do so. Travel distances are great in this country, and the courses are expensive – not because of fees, but because of time lost from practice, subsistence while on course, and the lack of tax concession for those who attend. Perhaps the difficulties associated with continuing education for dentists are not as bad as they seem. If the schools were really exciting students about the need for further study following graduation, these obstacles might be overcome; in far too many instances, however, the desire for additional training is simply not there.

Educators have become increasingly aware of the need to improve the understanding of dentists and dental students of the changing pattern of society and the role of the dental practitioner in society. Pleas have been made for programmes in the dental science curriculum designed to meet this need.[2,3] But, as with so many good ideas, the schools are hamstrung – caught between a curriculum already overcrowded with assignments and a reluctance to lengthen the dental course.

It is obvious that the frustration inherent in the conflict between the desire to carry out recognized and necessary changes for improvement, and the responsibility of the schools to provide the opportunity and supervision for necessary repetitive drill in restorative procedures, will not be resolved without major changes. Either the university course must be extended or the schools must be relieved of their responsibility for providing the facilities, opportunities and supervision of the repetitive clinical performance required for licensure. If either were done and a large block of student time thus freed for other purposes, dental education would be much better able to serve the more lofty purpose that Doherty[4] has described, "Thus our problem is to maintain education in an optimum position in a moving procession of civilization such that it will neither find itself overtaken by the rear guard nor so far ahead that it is out of intimate

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[1] Royal College of Dental Surgeons of Ontario: *Proceedings*. April 1962, p. 70.

[2] Blackerby, P.E. "Why not a Department of Social Dentistry?" *Jour. Dent. Ed.*, 24:197–200, 1960.

[3] Robinson, H.B.G. "A Projection of Trends in Dental Education." *Jour. Am. Coll. Of Dentists*, 27:173–176, 1960.

[4] Doherty, R.E. *The Development of Professional Education*. Carnegie Institute of Technology, 1950.

touch and even off the track. That position should indeed be always one of leadership; but in order for it to be this, education must not remain too long in a settled state."

Dental education has remained too long in a settled state.

Admission Requirements

In general the admission requirements for all six Canadian schools are similar. All demand about 14 years of educational experience for entrance to the first dental year – high school graduation plus one or two years in a general course in arts and sciences at a university. Since differences in educational systems exist from province to province, the terminology respecting pre-dental training may vary, although the basic background the students obtain seems to be much the same. At least they all seem able to cope with courses in their first dental year that do not vary appreciably in content or difficulty from school to school. Indeed the question has been raised as to whether students who are admitted are not too much alike. Almost all are admitted with minimum requirements as outlined in school calendars. This means their whole educational experience to that point has been very similar – they know the same things and their thinking is based on the same basic philosophy. Perhaps the profession would be better off if it did not insist on such a rigid course background for admission.

Dental schools admit students with one year less pre-professional training than medical schools require. This difference is hard to understand since both groups of students embark on similar basic science courses on entrance to their respective professional programmes.

For dental schools the minimum grades acceptable for entrance are similar to or higher than the requirements for entrance to other university courses. Satisfying the minimum requirements does not carry assurance of admission to a dental school however. Since more and more candidates are competing for the available spaces and success in the competition is largely based on past academic performance, something more than minimum qualification is generally necessary.

State of Knowledge and the Dental Curriculum

As noted by the Council on Education of the Canadian Dental Association, the subjects of study in the dental curriculum are well standardized and are listed as tollows in the Council's "Minimum Requirements for the Approval of a Dental School":[1]

Anatomy
Bacteriology
Dental Anatomy
Diagnosis
Endodontics
Histology
Hygiene
Medicine (General and Oral)
Anaesthesiology (General and Local)
Biochemistry
Dental Materials
Embryology
Ethics
History of Dentistry
Jurisprudence
Operative Dentistry

[1] Canadian Dental Association: *Official Actions 1950–60*. Toronto, 1962, p. 34.

Orthodentia	Pathology (General and Oral)
Pedodontia	Periodontia
Pharmacology and Materia Medica	Practice Management
Preventive Dentistry	Prosthodontia
Public Health	Physiology
Roentgenology	Surgery (General and Oral)

The Council on Education had deliberately avoided recommending hours of study for each course in order to provide flexibility in the dental curriculum and to permit change that may be deemed advisable from time to time. Even listing approved courses for study is inadvisable in some minds as being too restrictive. In this respect the Council is wise not to suggest hours of study because as Wilkinson[1] recently pointed out, there is a tendency for many to assume that such minimum requirements have the force of regulations.

Long before the Canadian Dental Association Council first listed the minimum requirements for approval of a dental school in 1948, the curriculum had already assumed a remarkable permanency. In any case, surely there is a need for some responsible organization to ensure that no school is permitted to fall below certain standards, and for this purpose periodic scrutiny by one's confreres can be a very healthy thing. In addition, in this country the tendency to permit fairly free acceptance of graduates from any of the schools for licensure in any province is increasing, and to permit this a stated minimum standard of training is necessary.

In Table 6–1, the average number of curriculum hours for each course taught in Canadian dental schools has been listed for 1961-62. The composite Canadian dental curriculum totals 4,170 hours spread over four academic years. About one-third of the course is spent in basic sciences, including dental materials, and about two-thirds spent in clinical disciplines. Almost two-thirds of the basic science training is given in the first dental year, and the balance in the second year – a reflection of the so-called "horizontal" teaching pattern where the basic sciences are taught as a block during early years and clinical teaching in the senior year. The amount of time devoted to basic sciences decreases sharply in the third and fourth year as clinical teaching increases.

As Table 6–1 shows, the course in all Canadian schools is basically the same with a fairly wide range of teaching hours for various subjects. The range is more often due to variations in local teaching arrangements than to the amount of subject matter covered. For example, pharmacology may include therapeutics in one school but not in another; some schools include dental materials with prosthodontics; roentgenology may be included with diagnosis, and so forth. In other courses such as endodontics and periodontics the wide range of teaching time is not so easily explained, and probably reflects the availability of able staff as much as anything. Some error may also be apparent in the table because of difficulty in accurately departmentalizing total clinical time. In preventive dentistry the range of from 20 to 290 hours is due at least partly to differences

[1] Wilkinson, F.C. "Dental Education." *Brit. Dent. Jour.*, 109:163–168, 1960.

TABLE 6–1

AVERAGE CURRICULUM HOURS, CANADIAN DENTAL SCHOOLS, 1961–62

Course	Year								Total All Years			
	I		II		III		IV					
	No. of Schools	Hours	No. of Schools	Hours	No. of Schools	Hours	No. of Schools	Hours	No. of Schools	Hours	Range	Per Cent of Curriculum
												%
Basic												
Anatomy, General[1]	6	350	1	35					6	355	290–415	8.5
Oral[2]	6	145	2	35					6	155	65–240	3.8
Bacteriology	1	150	5	120					6	125	95–140	3.0
Biochemistry	5	165	1	190					6	170	90–200	4.1
Pathology, General			6	105	1	90	1	10	6	120	100–180	2.9
Oral			2	80	4	45			6	55	30–100	1.3
Pharmacology			4	60	2	65	2	6	6	65	10– 90	1.5
Physiology	3	180	4	145					6	185	120–275	4.4
Dental Materials	4	75	3	55					6	95	15–160	2.3
Sum of Yearly Averages All Schools		800		445		70		10		1,325		31.8
Clinical												
Anaesthesia, General					3	15	6	20	6	25	5– 45	0.6
Oral			2	15	4	20			6	20	6– 30	0.5
Diagnosis			1	20	5	45	5	50	6	80	30–120	1.9
Endodontics			1	50	6	70	5	45	6	115	65–275	2.8
Medicine, General					3	30	4	25	6	30	15– 60	0.7
Oral					1	45	2	15	2	40	15– 60	0.3
Operative Dentistry	1	55	6	205	6	235	6	305	6	755	665–795	18.2
Orthodontics	1	30	3	45	5	60	5	65	6	130	50–220	3.1
Paedodontics			2	10	6	50	5	90	6	130	115–165	3.1
Periodontics			3	30	6	45	4	105	6	130	45–250	3.1
Preventive Dentistry	1	15	1	95	2	70	2	75	3	135	20–390	1.6

TABLE 6–1 (Concluded)

Course	Year								Total All Years			
	I		II		III		IV					
	No. of Schools	Hours	No. of Schools	Hours	No. of Schools	Hours	No. of Schools	Hours	No. of Schools	Hours	Range	Per cent of Curriculum
Prosth. Full D	3	105	6	115	6	220	6	190	6	575	415–775	13.8
Partial			4	90	2	20	3	50	5	110	90–190	2.2
Fixed	1	45	4	100	6	140	5	140	6	330	140–540	7.9
Public Health	1	20	1	30	3	15	3	20	6	25	5– 30	0.6
Roentgenology			1	15	4	40	3	40	5	60	35– 20	1.2
Surgery, General					4	30	3	15	5	35	15– 45	0.7
Oral			1	20	6	60	6	85	6	150	55–335	3.6
Therapeutics			1	10	3	25			4	20	10– 30	0.3
Sum of Yearly Averages All Schools		80		530		1,045		1.105		2,760		66.2
Miscellaneous												
History	2	10	1	15			2	5	4	10	5– 15	0.22
Ethics	1	5			2	15	5	10	5	10	5– 60	0.24
Jurisprudence	1	15			1	10	4	5	5	10	5– 15	0.24
Practice Management					1	20	3	15	5	15	10– 30	0.3
Sundry	5	20	4	15	1	10	1	20	6	40	10– 60	1.0
Sum of Yearly Averages All Schools		25		15		20		25		85		2.0
Total Yearly Averages All Schools		905		990		1,135		1,140		4,170		100.0

[1]Including Gross Anatomy, Histology and General Embryology.

[2]Including Tooth Morphology, Dental Histology and Embryology, and Comparative Dental Anatomy.

in concept of what such a course should contain. On the one hand a school may feel that this is the place for much "applied" basic sciences such as the chemistry of teeth and saliva, while another may include such material in another course altogether, and restrict the course in preventive dentistry to those preventive procedures applicable at the clinical level.

The great range of time spent teaching individual basic sciences is far more difficult to understand because the block of knowledge contained under each heading is much more standardized. Why one school feels it can teach an adequate background in biochemistry in only 90 hours while another requires 200, or why the range in time for teaching oral pathology should be from 30 to 100 hours is something that should cause concern to dental educators in this country.

The apparent lack of correlation between the basic sciences and at least certain aspects of clinical dentistry has been of considerable concern to dental educators for years. It has been discussed, debated, and changes advised many times. Still, as Macdonald[1] pointed out, a chasm seems to exist between the two. Perhaps if, after all of these years, attempts to correlate are still unsuccessful, it may be reasonably safe to conclude that there is no strong correlation between much of what now occupies the dentist clinically, and the basic sciences. Where practical correlations do exist they are obvious, e.g., the relationship of anatomy, histology and pathology to oral diagnosis. Where little if any correlation exists, e.g., in placement and polishing of amalgam fillings, it seems futile to waste effort trying to find it. Lack of correlation with clinical procedures by no means justifies excluding basic sciences from the dental curriculum. Where the basic sciences do have practical application they are extremely important clinically. And what is just as important, though less tangible, they provide a basis for understanding and a background of knowledge which forms the foundation for more advanced study and further professional progress.

In 1957 Harold Noyes,[2] in predicting trends in dental education for the next ten years, pointed out that great changes should not be expected within only a ten-year period. Curriculum changes occur slowly, and Noyes also pointed out it would probably be unhealthy were they to change with every new idea or whim. Just how slowly change occurs is reflected in Table 6–2 where the percentage of time devoted to various disciplines has been listed for the Canadian curriculum 1961-62, for the United States curriculum in operation 1941-42, and 1958-59, for the curriculum suggested by the United States Curriculum Survey Committee 1934, and that suggested by the United States Dental Education Council 1926. Since 1926 the curriculum has increased by about 500 hours, but the relative time devoted to various subjects has remained remarkably unchanged. In all subjects, of course, the material will have been modified as knowledge has changed in each area, although the basic arrangement in the course remains the same. In the basic sciences some adjustments have occurred, e.g., biochemistry

[1] Macdonald, J.B. "The Role of Basic Sciences in Dental Education." *Jour. Dent. Ed.*, 21:17–21, 1957.

[2] Noyes, H.J. "Trends in the Dental Curriculum for the Next Decade." *Jour. Dent. Ed.*, 21:203–208, 1957.

is up a little more than 1 per cent (75 hours) and anatomy is down slightly, but the total time for basic science teaching has not been altered by much more than 1 per cent.

TABLE 6–2

AVERAGE PER CENT DISTRIBUTION OF DENTAL CURRICULUM TIME· U.S.A. SUGGESTED 1926, RECOMMENDED 1934, IN OPERATION 1941–42 AND 1958–59; CANADA IN OPERATION 1961–62

	United States				Canada
	Suggested 1926[1]	Recommended 1934[2]	In Operation 1941–42[2]	In Operation 1958–59[2]	In Operation 1961–62
	%	%	%	%	%
Anatomy (Incl. Histol. Embryol. Dent. Anat.	13.4	13.05	12.94	13.22	12.3
Bacteriology	3.4	2.19	2.91	2.68	3.0
Biochemistry	2.6	2.93	3.08	3.39	4.1
Pathology (Gen. & Oral)	4.7	4.39	4.22	5.26	4.2
Pharmacol. & Mat. Medica	1.7	1.83	2.14	2.05	1.8
Physiology	3.9	4.39	3.98	3.67	4.4
Dental Materials	1.3	2.20	2.16	2.15	2.3
Total Basic	31.0	30.98	31.43	32.42	32.1
Diagnosis		2.74	1.94	2.26	1.9
Endodontics		0.46	0.91	2.11	2.8
Medicine (Gen. & Oral)	C	3.39	1.65	1.52	1.0
Operative Dentistry	L	23.63	20.58	15.85	18.2
Oral Surg. & Anaes.	I	2.47	4.96	4.53	5.4
Orthodontics	N	2.56	2.88	2.13	3.1
Paedodontics	I	—[3]	2.33	4.20	3.1
Periodontics	C	—[3]	2.10	4.23	3.1
Preventive Dentistry	A	—		0.56	1.6
Prosthodontics	L	23.33	25.94	26.10	23.9
Public Health		1.83	1.00	0.54	0.6
Roentgenology		1.42	1.41	1.68	1.2
Total Clinical		61.83	65.70	65.71	65.9
History, Ethics, Jurisprudence, Pract. Management	0.9	3.16	2.87	1.32	1.0
Other		4.03[4]		0.55	1.0
Total Misc.	0.9	7.19	2.87	1.87	2.0
TOTAL	100.0	100.0	100.0	100.0	100.0

[1]Suggested but not required by Dental Education Council, U.S.A. 1926 (Gies, p. 655).

[2]Survey of Dentistry, U.S.A., p. 315.

[3]Included in Operative Dentistry.

[4]Includes Physics and Chemistry.

In the clinical areas it is not possible to compare today's time allocation with the 1926 recommendations, but the curriculum hours recommended by the United States Curriculum Committee 1934 are still being followed almost to the hour. If the 4 per cent of time recommended for teaching physics and chemistry

in 1934 is added to clinic time, then except for minor shuffling in courses such as endodontics and orthodontics, the distribution of time remains basically unchanged.

This lack of change in the dental curriculum has not been limited to this continent. Horsnell[1] pointed out that little change had occurred in Great Britain during the twenty-year period 1935-1955.

As has already been suggested, perhaps this stability reflects the fact that the design for teaching dentistry has worked very well in preparing dentists for practice. One surely must expect that had serious flaws been present, they would have been corrected by this time. On the other hand, the lack of change possibly indicates that as long as the schools bear the responsibility (admitted or otherwise) for certifying that its graduates have the necessary skills and clinical experience for licensing immediately on graduating, it is not possible to change the distribution of time in the curriculum appreciably. The amount of time required by students to obtain minimum experience for licensing is unlikely to change, unless some method is developed for acquisition of skills other than repetitive performance of an operation. This is not probable. Currently in the curriculum about one academic year is devoted to this purpose. Surely this can be considered a minimum time needed to acquire the multitude of skills and the experience necessary to practise dentistry.

Why should it be necessary to change the dental curriculum? If it has done so well for such a long period of time, why not leave it alone? Change is long overdue and for a number of reasons. In the first place the dental school curriculum is now badly overcrowded with assignments. One of the purposes of all higher education is to enable students to learn to think for themselves. In the dental school today students are lectured, laboratoried, given assignments, quizzed and examined, to the point where most of their time is spent scurrying to prepare for the next assignment or quiz, rather than trying to develop initiative and thinking ability. Dental education, as other professional education, is plagued with what Doherty[2] has called "subject matter-itis" generally directly concerned with the professional training. Dental students have little opportunity to acquire the broader educational experience readily available through the university. Such are the professional demands on student time that almost none is left in which to enjoy something of the thoughts and lives of great men of the past, of music, philosophy and other experiences that should be part of higher education.

In addition, of late there has been some awakening to the fact that in dentistry the subject of sociology has been sadly neglected. Dentistry now finds itself hard pressed by society to bring about quite unexpected departures from tradition – changes that should have been anticipated and planned in advance. More planning might have occurred had the profession been made more aware of how the nature and laws of human society were changing. Rather belatedly

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[1] Horsnell, A.M. "Dental Education in Great Britain." *Jour. Amer. D.A.*, 50:501–506, 1955.

[2] Doherty, R.E. *Op. cit.*

and in an effort to avoid similar situations in the future, we find the suggestion that instruction in this area be given in the dental course.[1] [2]

Recent conferences[3] [4] on training and utilizing dental assistants and training dental students to use the services of dental assistants to maximum advantage, attest to the interest in this area. Considerable effort is now being spent trying to work out the best system of permitting dental students to gain experience in this area. It is well worth doing, but it is another of the things that throws additional strain on the dental curriculum.

Finally, and this is perhaps the most pressing reason for curriculum change, with advances that have been made in various special clinical areas of dentistry, far better service could be rendered to the general public if much of what is now taught as specialties could be included in the undergraduate curriculum. A dentist with wider training would have less need to refer patients to specialists. The expansion of the specialties means higher service costs to the public.

In spite of the need to alter the dental curriculum it is ridiculous to think of adding more to it as it now stands. It cannot be done unless major revisions are brought about, and these must start at the beginning – with the objectives of dental education. If the primary objective of the dental curriculum were to train students to *become* dentists rather than to *be* dentists, then the problem could far more realistically and constructively be dealt with. One could then think of dental education as Doherty[5] conceived of education for engineers – "An undergraduate course in engineering should train students to become engineers and not train engineers; it should develop a foundation for later professional specialization, yet it should constitute at the same time a balanced education. It should thus be a bilateral programme involving on the one side the mastery of the fundamental principles of the physical and mathematical sciences, and a rigorous discipline and reasoning in which these principles are applied to the analysis of problems; and on the other the acquirement of a basic knowledge of English, history and the pertinent social sciences and the application of such knowledge to social and economic problems. Thus the prime objective pervading and unifying the whole should be the development of the power of analysis and understanding and the cultivation of a scholarly attitude and style". Education of dentists on a similar basis, with the fundamental principles of the biological sciences forming the basis for analysis of problems would be a most exciting prospect.

If the dental curriculum were to undergo the extensive revision that would be necessary to achieve these goals, then a new problem is created – where to

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[1] Willard, W.R. "Social Dentistry as Viewed from the Perspective of Education for Medicine and Other Health Professions." *Jour. Dent. Ed.*, 24:201–205, 1960.

[2] Blackerby, P.E. *Op. cit.*

[3] "Training Dental Students to use Chairside Assistants." Summary of a Conference, January 14-15, 1960. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

[4] *Proceedings:* Conference on Utilization and Training of Dental Assistants. Council on Dental Education, American Dental Association and American Association of Dental Schools. September 13-15, 1960.

[5] Doherty, R.E. *Op. cit.*

provide the dental school graduate with the necessary supervised experience and training to qualify for licensure. Since all of this could not be done in four years, the answer seems obvious – either an additional year would have to be added in the university or a year of internship would have to be arranged in a clinic, preferably as part of a general treatment hospital. The latter is preferable by far and is discussed more fully in the last section of this report.

Education Versus Training in the Dental Curriculum

Dental education has repeatedly been criticized by educators both within and outside the dental profession because of the high proportion of time devoted by students to the acquisition of digital and technical skill. The basis of this criticism is that there is no place for such a function in the university. The criticism is basically correct. The function of the university is to transmit and advance knowledge and understanding, not to provide a place in which to acquire technical skill. The university should develop an understanding of the 'why' rather than the 'how'. The criticism that dental schools are more concerned with the 'how' than the 'why' has been applied with varying degrees of justification to other professional schools as well.

Is this criticism entirely justified for dentistry? When a thing is criticized often enough, everything associated with it often becomes included, and in the case of techniques in dental education this is not justifiable. While repeated manipulation of a metal or other material in order to become skilful in its use should not be included as a university discipline, the development of an understanding of the chemical and physical properties of the metal or material and how these properties can be used in solving a biological problem is part of higher education. Learning the principles of where, why and how to make the necessary cuts to repair damaged teeth is education; doing the procedure repeatedly in order to be able to do it quickly and skilfully is training, not education. In dental education there is no problem in applying the knowledge taught in the basic sciences to the principles of diagnosis and treatment of the sick; the frustration in application comes in trying to correlate the basic sciences with this repetitive drill. The stumbling block is the repetition, not the sound and useful principles involved.

Perhaps one might justify the inclusion of repetitive clinical procedures in the university if new knowledge were being accumulated through research involving them. Such is not the case, and in any event the arguments against still outweigh the arguments in favour. The dental curriculum directly or indirectly still places far too much emphasis on 'the thing' rather than the principle behind the thing. This unfortunate situation is likely to continue as long as technical perfection continues to receive an emphasis in student grades equal to, or greater than, that given to scholarly achievement. Some indication of change designed to correct this seems to be in the air, and perhaps Burkett[1] is right when he says "The time may not be too distant when the evaluation of a dental school will be based

[1] Burkett, L.W. *Op. cit.*

less on how its graduates fare in licensing examinations, and more upon what its graduates have contributed to our fund of knowledge and how many it has prepared for research and teaching".

Relation to the Medical School and Other University Departments

Ever since they became part of the university, dental schools have relied on other departments to teach the disciplines they were seeking when the affiliation was made. More dependence has been placed on the medical school than on any other, because the departments teaching the basic biological sciences and the clinical disciplines such as medicine and general surgery were located here. In addition some subjects such as physical and organic chemistry and English are taught in other departments outside the dental school.

In general the arrangement has worked well, at least from the standpoint of dental education. The contribution of the basic science departments in particular, to the advancement of dental education has been very great indeed. Co-operation between these departments and the dental school has been excellent for the most part, although criticisms have been levelled with some justification from time to time. Some of the criticism has come from dental schools who felt that their students were not getting the best quality of teaching of which a department was capable. Some has come from medical departments who have felt that, because their basic responsibility was to the medical school, teaching dental students siphoned off so much of their energies that quality of teaching in the medical school was threatened.

The relationship between medical and dental schools is becoming stronger rather than weaker. Within the last few years a number of dental graduates, with graduate experience in one of the basic sciences, have joined the staff of dental schools. Their teaching and research is encouraging closer liaison between the two university divisions. Occasionally dual appointments have been made and dental school instructors asked to assist in teaching medical students. Both these arrangements have helped enhance the relationship. The new dental schools have also provided in their budget for the appointment of additional staff to medical school departments, commensurate with the increased load placed on the latter because of the requirements of teaching dental students.

Occasionally for local reasons basic science teaching has been done in the dental school. This arrangement can have a salutory effect on dental teaching since it brings the basic sciences physically and psychologically closer to clinical teaching. It also encourages research in the dental school which has a very stimulating effect on the dental programme. It is costly to do this however, and with the general shortage of adequately qualified personnel, duplication of departments might be quite impractical.

Demands for the services of basic science departments is increasing, and many other groups in addition to medical and dental students look to them for instruction. This is leading to the concept of the 'Health Sciences Centre', through which the basic science departments form a separate university unit with its own administrative head and separate budget. Under this arrangement departments have no first loyalty to any professional faculty. Their teaching services

can be distributed in accordance with general demand rather than in accordance with their impact on teaching in one faculty. In areas in the United States where a health sciences centre exists, the arrangement seems to be working quite satisfactorily and it is a system that offers great potential.

Another relationship that should be mentioned, although the department involved is not really a division of the university, is that between the dental school and the general hospitals. The experience that the dental student obtains in hospitals varies a great deal between schools in Canada. In most instances it is far from adequate. The one notable exception to this is McGill, where dental students obtain all of their clinical experience in the hospital because the dental clinic functions as an out-patient department. Opportunities for Alberta dental students to obtain hospital experience are also better than average, but in other cases dental students rarely see the inside of general hospitals. The general principle that sick people should be treated as whole persons either in or out of hospital applies equally across the country, but carrying out the principle varies considerably. The demand on hospitals for dental service is great and perhaps the day will come when such service will be made available in hospitals in this country. As the service grows, unquestionably the opportunities for dental students to experience the hospital environment will grow with it to the betterment of dental education.

B. POSTGRADUATE AND GRADUATE CURRICULUM

At present opportunities for continuing education are very limited in Canadian dental schools – limitations imposed by lack of qualified staff, space and funds. In general the organized programmes that do exist are of three basic types:

1. those providing the opportunities to qualify for certification as specialist;
2. short concentrated refresher courses;
3. programmes leading to graduate degrees with research training as the primary objective.

1. Specialist Courses

There is no general agreement across Canada as to what divisions of dentistry should be specialties. The Canadian Dental Association recognizes three, Oral Surgery, Orthodontics and Periodontics. In addition some provinces recognize such fields as Paedodontics, Prosthodontics and Public Health Dentistry as specialties. Only two of the dental schools offer training in these areas, and in one of these Orthodontics is the only field offered. The total potential number of graduates from all of the programmes is approximately 30, with the largest segment of these in Orthodontics.

To be admitted to a course leading to specialist certification applicants must have successfully completed a programme leading to the degree of Doctor of Dental Surgery or Doctor of Dental Medicine, or possess the equivalent. In general, admission committees give preference to graduates with some experience in general practice, preferring not to accept graduates immediately out of the dental school. In most of the courses competition for admission is keen and

academic performance as an undergraduate is the most important single criterion for assessing the potential of applicants. Also since opportunities for training exist in only one or two locations an effort is made to obtain well-qualified applicants in areas in Canada where the number of specialists is low and where specialist services are needed.

Excepting for the programme in Dental Public Health which does not involve clinical treatment, the curriculum for a specialty programme is designed to provide an opportunity for intensive study and clinical experience in one area. Instruction is generally by seminars and includes refresher courses in the basic sciences followed by advanced study in the special clinical area concerned. Instruction and supervision is on a much more flexible and personal basis than is possible in the undergraduate curriculum, although the specialist programmes are more rigidly prescribed and less individually designed than those to train research workers. Usually some research is done by all specialty candidates, the amount largely depending on departmental inclination and time available. Usually with the need to cram as much clinical experience as possible into the two- or three-year period for study, opportunity for original research is limited. All candidates are required to review and criticize literature extensively.

The only course leading to qualification in Dental Public Health in Canada is at Toronto. It has been arranged in close collaboration with the School of Hygiene of that University. The University of Toronto School of Hygiene is responsible for programmes leading to public health qualification in other fields, and dental candidates take much of their training with these other groups. Their 'clinical' experience takes the form of field work in public health units in communities around Toronto.

Specialty courses vary in length from one year in Public Health, to two years in Orthodontics, Paedodontics and Periodontics, to three in Oral Surgery. It seems that where clinical treatment is involved and particularly where treatment assessment must necessarily extend over a long time, two years is barely adequate to provide good training in a specialty.

When the specialty programmes were begun in the dental schools on this continent, most schools seemed to assume that the programmes would gain in stature if the long-established Master's degree were granted to successful candidates. Accordingly students were required to do some research – at least enough to satisfy minimum university requirements for the degree. These programmes were then labelled 'graduate' although as Burkett[1] pointed out, they often were not graduate within the university frame of reference. Indeed, within the limit of time required for the courses a candidate can hardly be expected to obtain the advanced clinical experience required to be a specialist, and at the same time qualify as an independent research worker as the degree indicates. It is hard to understand why the dental schools were reluctant to accept a university certificate or diploma to indicate successful completion of specialty courses. They could then have created their own status for this award, instead of usurping the most readily available meaningful university degree, even though the meaning had nothing to do with clinical dentistry.

[1] Burkett, L.W. *Ibid.*

Surely if graduate students in dentistry are to become as experienced and skilled in research and research methods as the Master's degree implies (and unfortunately in some areas because of misuse this implication might not be too strong) the schools should work to do it properly. They should stop the pretence that independent research workers are being trained in these clinical specialty programmes. Research methodology is probably no more difficult, but certainly no easier to learn, than any other discipline. But it is complex enough that it cannot be adequately grasped by individuals working part time a few hours a week, and it is not right to infer that it can. The utilization of well-established university degrees by groups for purposes other than that for which they were intended, has been the subject of considerable and justifiable concern to graduate schools throughout the years. Dental and other professional schools should accept some award other than a graduate degree for specialty courses, allowing the graduate degree to be used for its original purpose. This is not to say that research should not form part of the training of the specialist. Indeed the specialist must have a very sound understanding of research if he is to be worthy of the title of specialist, but unless he is a most remarkable person he will never learn to be a good specialist and a good research worker in two short years.

2. Refresher Courses

A number of the dental schools in Canada provide a series of short intensive refresher courses for dental practitioners. Sometimes these are given in the school with participants spending from two days to a week as full-time students (Table 5–10). In other cases, in an effort to solve the problems of time and travel for those who desire to attend, one or more staff members of a school may travel some distance from the university to present one- or two-day clinics. It appears that this arrangement has become very popular, although accurate attendance figures are not readily available. In addition school staff members are frequently called upon to lecture to dental societies and study clubs as part of postgraduate instruction.

Almost all such programmes are designed to provide a brief intense review of some clinical or biological area related to dentistry, to discuss new methods or materials. They serve a very valuable purpose in this regard.

3. Graduate Courses

Not all of the dental schools are considered graduate departments in the university, although evidently all could be if the request were made. At the moment only two schools offer programmes intended to train candidates as research workers, and both are organized within the School of Graduate Studies of the individual universities. The programmes usually involve study with emphasis in a basic science and a research programme related to dental or oral biology which forms the subject for the required thesis. It has been many years since anyone obtained a Doctor of Philosophy degree through the graduate department of a dental school in Canada. While a research problem in the growth or biology of dental or oral tissues would form a highly satisfactory subject for a Ph.D. investigation, dental science *per se* is hardly broad enough to afford a satisfactory background

for a Doctorate of Philosophy. Programmes arranged in collaboration with a basic science department of the university with dual sponsorship of the candidate by the basic science worker and the dental research worker would serve a more useful purpose.

Unfortunately, though the need for people with this kind of training is great in Canada, few such candidates are being graduated. Many more must be trained if the schools are to become adequately staffed, or if research is to grow.

CHAPTER 7

RESEARCH

Of all the factors operating to guide the development and destiny of mankind, none has greater significance than research. The Honourable Hugh John Flemming, Minister of Forestry, recently has been quoted in part as follows:[1] "It is no exaggeration to state that our whole social and economic revolution has been, and is being, born of man's inborn curiosity concerning everything from a grain of sand to the universe as we presently know it. This is research – and without this untiring search for answers to the infinite problems confronting our scientists, we would probably still be cave dwellers". Because of the relatively wide publicity given to developments in research today, we tend to think of it as new, when in fact the search for knowledge began far back in history. Frederick the Great is reported to have said,[2] "The greatest and noblest pleasure which man can have in this world is to discover new truths; and the next is to shake off old prejudices".

The impact of research on efforts to alleviate the problems of dental disease, its prevention, treatment and control, is no less significant than on other aspects of living. Of the four characteristics that identify a profession,[3] organization, literature, educational programme, and research, only research offers hope that dental disease will be prevented. This is perhaps the characteristic most significant to mankind.

Dental education and dental research should go hand in hand. The dental faculty that does not contribute to the advancement of knowledge is not fulfilling its total responsibility as a part of a university. As McKinnon[4] intimated in discussing the functions of the university, society may press the universities for increased enrolment and more graduates, without similar emphasis on the need for increased research, but the university that places all its emphasis on the provision of social services is not truly functioning as a university.

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[1] Flemming, Hon. Hugh John. Address to Ottawa Rotary Club, quoted in *The Globe and Mail*, October 17, 1961.

[2] Weinberger, B.W. "The Educational Evolution of the Dental Surgeon." *Dental Cosmos*, 71:516–526, 1929.

[3] Fleming, W.C. "Role of Dental Research in Dental Education." *Jour. Dent. Ed.*, 21:318–323, 1957.

[4] MacKinnon, F. "The University: Community or Utility." *The C.A.U.T. Bulletin*, 10(2):4–11, 1961.

GROWTH OF RESEARCH IN CANADIAN DENTAL SCHOOLS

During the years immediately following the 1914-18 war, a small group of far-seeing Canadian dentists recognized that the hope for the advancement of dentistry lay in establishing an active research programme – a virtually new departure in dental education. Accordingly, funds were solicited from dentists and dental organizations across Canada to establish the Canadian Dental Research Foundation as a memorial to dentists who died during the war. About $17,000 was realized. For some 25 years this provided the only continuing source of support for dental research in this country. The remarkable foresight of the sponsors of the Foundation is better appreciated when it is realized that until then no really close association had been established between the various groups of dentists in Canada; no other funds were in existence to support dental research; and there was almost no personnel on the staff of the schools specially trained to carry out research projects.

In 1944 the Canadian Dental Association, through its Research Committee, allocated funds to provide a form of fellowship to support dental graduates undergoing research training. Since 1955 Canadian Dental Association grants have also provided support for undergraduate dental students while working in research laboratories during the summer. A summary of the amounts granted and the number of individuals to whom grants were made each year by the Canadian Dental Association is shown in Table 7–1.

In 1945 the National Research Council of Canada established the Associate Committee on Dental Research to advise the Council respecting funds for the support of dental research. These funds not only made available additional and more generous fellowships but provided for the purchase of equipment and for the support of research projects. A summary of N.R.C. support for personnel is shown in Table 7–1 and for total support in Table 7–2.

Since 1952 the Department of National Health and Welfare has also supported dental research (Table 7–2). In 1962 Federal Government and Canadian Dental Association support, together with funds received from philanthropy, industry and from the United States National Institutes of Health, totalled just over $300,000 – less than half of 1 per cent of the total Canadian dental bill. The relatively rapid increase in spending for dental research over the last decade or so reflects a growth in research occasioned by the appointment of more staff with suitable training to the schools. Even with this considerable increase in federal support since 1945, the growth of dental research has lagged far behind that for medicine (Figure 1) Between 1949 and 1955 the growth rates were somewhat similar; otherwise medical research has grown very much faster. The slower growth rate in dentistry has been due more to a lack of trained research personnel than to a lack of funds. As more trained staff become available and are taken on as members of dental faculties, requests for money will increase. The demand will also increase as new schools are established, just as happened when the school in Manitoba began to function a few years ago.

TABLE 7–1

EXTRAMURAL DENTAL RESEARCH TRAINING GRANTS, CANADA TO 1962

Year	Source								Totals		
	Canadian Dental Association				National Research Council						
	Undergraduate		Graduate		Undergraduate		Graduate		Undergraduate	Graduate	Grand Totals
	No.	Amount	No.	Amount	No.	Amount	No.	Amount			
1948			3	1,400						1,400	1,400
1949			4	2,300						2,300	2,300
1950			3	2,300						2,300	2,300
1951			4	3,800			2	3,700		7,500	7,500
1952			2	1,700						1,700	1,700
1953			2	1,200						1,200	1,200
1954			3	3,700			2	6,000		9,700	9,700
1955	1	1,000	2	2,100			2	6,000	1,000	8,100	9,100
1956	1	400	3	5,600			3	10,500	400	16,100	16,500
1957	3	900	3	5,700					900	5,700	6,600
1958	7	4,500	5	12,400	5	5,300	3	11,200	9,800	23,600	23,400
1959	4	3,200	2	3,900	7	6,800	4	16,000	10,000	19,900	29,900
1960	7	5,400	1	2,500	5	4,300	7	27,500	9,700	30,000	39,000
1961	8	6,900	2	4,000	18	17,400	4	16,700	24,300	20,700	45,000
1962	10	7,000			20	16,500	4	18,500	23,500	18,500	42,000
		$29,300		$52,600		$50,300		$116,100	$79,600	$168,700	$248,300

Total C.D.A. $81,900

Total N.R.C. $166,400

TABLE 7–2

CANADIAN GOVERNMENT EXTRAMURAL SUPPORT FOR DENTAL RESEARCH
1945–1962
(thousands of dollars)

Year	Agency		Total
	National Research Council	Department National Health and Welfare	
1945	9		9
1946	18		18
1947	26		26
1948	29		29
1949	29		29
1950	30		30
1951	29		29
1952	27	14	41
1953	34	23	57
1954	38	19	57
1955	37	22	59
1956	48	26	74
1957	47	26	73
1958	63	29	92
1959	78	32	110
1960	102	33	135
1961	132	45	177
1962	184	43	227
Total	960	312	1,272

Clinical research has been sadly neglected in dentistry. This neglect has been due to lack of trained personnel rather than lack of money or need. Few clinical instructors in dental schools have all three of the requirements to do research; training, time and inclination. The result is that although there is a great need to improve and develop methods of treatment in dentistry the field remains almost entirely neglected. The figures showing support by the Department of National Health and Welfare in Table 7–2 reflect the size of the clinical dental research programme in Canada.

KINDS OF RESEARCH IN DENTISTRY

Any orderly planned procedure designed to add to the sum of human knowledge can properly be called research. In a field such as dentistry research generally falls into one of two major categories, basic biological or technical research, and applied or clinical research. To these should be added one other, educational research. It is difficult to say which is most important; all have a place and all are now going on in varying degrees in Canadian dental schools.

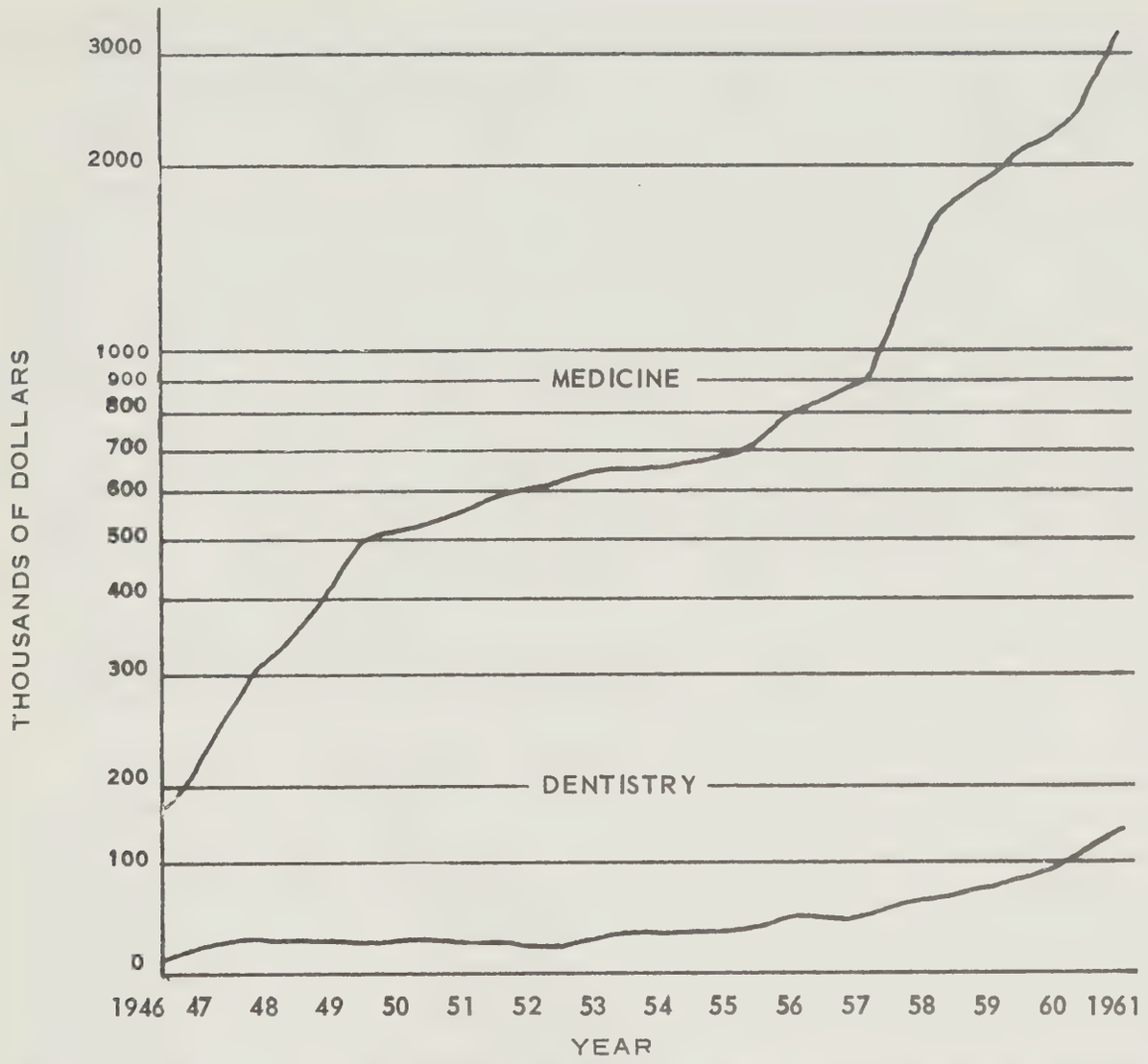

Figure 1. Rate of growth (log scale) of support for medical research by the National and Medical Research Councils,[1] and for dental research by the National Research Council; Canada 1946 to 1961 (thousands of dollars).

[1]Source — Farquharson, R.F. "Support of Medical Research in Canada". *Canad. Med. Assoc. J.*, 86:687–689. 1962.

Most of the research conducted in dental schools is of a basic or fundamental nature, primarily in biology, and to a lesser extent in metallurgy related to dental materials. It is in the basic field where the major research emphasis should probably remain. As the late Dr. E.W.R. Steacie has pointed out,[1] while clinical or applied research may produce some spectacular results that more than justify the money spent on it, it will not go far unless it has as its basis the fundamental research of the scientists who proceed simply to explore further into the secrets of nature, and without thought of immediate practical application. A number of examples could be given to show how the impractical of today may be very practical in the future. One of the best illustrations may be found in the report of the Medical Research Council of Great Britain,[2] 1960-61. It points out that the basic impractical research on the effect of ionizing radiation on cells being

[1] Underhill, F.H. "The Liberal Arts and Public Affairs." *The C.A.U.T. Bulletin*, 10:11–25, 1962.

[2] *Report of the Medical Research Council 1960-61*. London: H.M. Stationery Office, Cmd. 1789. July 1962.

carried out in the 1930's became terribly practical wnen the first atomic bomb went off, yet no one could have predicted the terrible significance of the original work as it was going on. The real problem in dentistry, as Brown[1] indicated, is not a shortage of dentists but a surplus of disease. This surplus will be removed only when further basic research paves the way.

Dental treatment will be with us for a long time however, and the problems of the clinic can no more be solved by rule of thumb and empiricism than can any other problem. The clinician should be concerning himself not only with the development of better methods of treatment for the individual patient, but also with providing a more widespread and better dental service to the population as a whole.

With two or three exceptions, Canadian research in clinical dental treatment is almost non-existent. With regard to exploring the ways and means of providing a broader and more efficient dental service to the public as a whole, even less research is going on. Only the Royal Canadian Dental Corps seems to be scientifically evaluating effective utilization of trained auxiliaries on efficiency of treatment procedures.[2] The impact of group practice, methods of operating a practice, etc., from the standpoint of providing a more efficient service to the public is just coming under study.[3]

Research in the field of dental education is also just now undergoing a rather exciting beginning. As Ellis[4] has pointed out, few research projects in the dental field hold opportunities of such far-reaching importance for the entire dental profession as those in dental education. Every aspect of dental education – admission and selection procedures, examination methods particularly in the clinical field, specific teaching methods, and specific courses are in need of study from the research standpoint. The advantages of having such work conducted in co-operation and collaboration with the licensing boards is obvious, particularly when the research relates to major departures from conventional teaching or to matters such as auxiliaries' services which relate to licensing.

RESULTS OF RESEARCH AND THEIR IMPACT ON DENTAL EDUCATION

It is difficult to express the significance of research to dental education. From the very beginning of dentistry, research – making and recording of observations – led to the accumulation of the body of knowledge which formed the basis for the organization of the profession of dentistry and its educational system.

Many examples could be used to show how research, by adding to knowledge, has led to changes in individual course content, even if the examples included only work carried out in Canada. During the fifteen-year period 1945-1959 inclusive, over 100 publications emanated from work supported by funds from the

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[1] Brown, H.K. "The Health Professions and the Challenge of Widening Horizons and Changing Patterns." *J. Canad. D.A.*, 28(1): 1–5, 1962.

[2] Baird, K.M., Shillington, G.B., and Protheroe, D.H. "Pilot Study on the Advanced Training and Employment of Auxiliary Dental Personnel in the Royal Canadian Dental Corps." Preliminary Report. *J. Canad. D.A.*, 28(10):627–638, 1962.

[3] Canadian Dental Association: *Transactions, 1962.*

[4] Ellis, R.G. "A Review of Dental Education Suggests a Fertile Field for Research." *Austr. Dent. Jour.*, 1:8–12, 1956.

National Research Council alone.[1] The ramifications of this work extend far beyond dental education and in many instances have led to a broader understanding of many basic biological processes. The epidemiological work in Canada on the action of fluoride in preventing dental decay has contributed a great deal to the development of fluoridation as a sound public health procedure.

Clinical research is leading to a re-evaluation of many treatment procedures that may have been based more on empiricism than on science. Methods are being developed that will improve earlier diagnosis of malocclusion, and that will provide better predictions of susceptibility to decay, thus allowing remedial measures to be adopted earlier. This should provide improved results over a shorter time and at less cost.

Improvements in methods for selecting dental candidates are developing but research in this subject has not been going on long enough for final conclusions to be drawn. Current studies on present methods of examining and evaluating students have already revealed serious flaws, even though they are as good as most in general use. New improved systems are developing together with a refreshing change of philosophy on the part of staff as to the meaning of examination grades and their use in evaluating student performance.

Furthermore, as one writer expressed it,[2] "One of the chief objectives of general and dental education should be to encourage a student to think. Too many people do not think in this day and age; they just rearrange their prejudices". As long as dental students are not taught to ask "why?" they never will learn how to think. There is nothing like an active research programme in a school to make "why?" a most acceptable and welcome word in the vocabulary of both students and staff. Without research, empiricism in both treatment and teaching will continue to hinder advance.

PURPOSE OF RESEARCH IN A DENTAL SCHOOL

Dental faculties as parts of universities are obliged to do research – it is part of their job. Just as a university that is not contributing to the advancement of knowledge is not a true university, so, too, a dental school that is not carrying out research is not a true educational institution – it is a training school. If dental education is to be effective and rational it must be done with a proper blending of research and teaching; if its objective is to perpetuate empiricism it has no place in a university.

Dental schools form the logical and proper centres for carrying out research of a basic scientific nature. As university departments they are afforded much more flexibility in interests and activities than is possible any other way. To move dental research into special institutions would weaken the overall teaching programme. It would deny undergraduate students contact with the people whose interests range beyond the pedantic. and who are the most apt to inspire more young dentists to enter a career of teaching and research.

RELATION TO UNDERGRADUATE AND GRADUATE TEACHING

Thirty-three years ago Dr. Wallace Seccombe, Dean of the Faculty of Dentistry, University of Toronto, speaking as the President of the American

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[1] *The Canadian Dental Association.* Brief submitted to the Royal Commission on Health Services. Ottawa, March 1962, p. XXIV – 9 to 15.

[2] Editorial: *Jour. Dent. Ed., 23:80, 1959.*

Association of Dental Schools said,[1] "While research may be carried on quite independent of teaching, real vital teaching cannot be carried on independent of research. To limit teaching strictly within the circumscribed area of things that are known would be to rob teaching of its vivifying force and leave it a grind of uninteresting, routine and tiresome drudgery. When a teacher ceases to learn, he ceases to truly teach".

The two basic fundamental reasons for the existence of universities – advancing and transmitting knowledge – complement one another. One cannot go on in the absence of the other without something of value being lost. It is true, of course, that the loss is not always so serious when research goes on without teaching as when teaching goes on without research. Either way the loss is important, however, and should be avoided. As Seccombe[2] also mentioned, the researcher has a responsibility to teach. It is unfortunate when a research group loses contact with the teachers in a school, and use the very thing that should give the greatest inspiration toward good teaching as an excuse to avoid it. Research workers can become stale. There is nothing like the challenge of trying to impart new concepts and knowledge into the minds of a group of young people to prevent this staleness.

An undergraduate dental school without research becomes nothing more than a glorified training institute. Existence for the sole purpose of transmitting knowledge is only half an existence in the university, and under these circumstances teaching often becomes dull, repetitious and pedantic. Seccombe[3] observed, "The average student's attitude is to learn what is known and just enough of it to pass an examination. The moment he earnestly considers an unknown problem a new world opens to him and his mental development receives great stimulus. At that moment he begins to think. The student does not have to research to obtain some concept of the challenge facing us in the unknown, but I fail to see how the teacher can convey this without having engaged in research himself".

For the teacher engaged in graduate instruction research is absolutely necessary. True graduate teaching simply cannot exist without research. Programmes in dental schools which are called graduate but which provide only sufficient limited research contact to satisfy minimum university degree requirements, are misnamed. A real graduate programme wholly immerses a student in research; it does not simply sprinkle him with it.

Postgraduate clinical instruction, like undergraduate instruction, can go on in the absence of research, but it suffers by so doing. That it sometimes does so is a sad reflection on current programmes. While these programmes are not intended to make research workers out of students, surely any clinical specialist not thoroughly grounded in the principles and philosophy of research is poorly trained.

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[1] Seccombe, W. "A Plan for the Development of Research in a Faculty of Dentistry." *Proceedings:* American Association of Dental Schools. 5th Meeting:66–75, 1929.

[2] *Ibid.*

[3] *Ibid.*

NEED FOR PERSONNEL

The one factor of particular significance to the rate of growth of dental research in Canadian dental schools over the last 15 years (Figure 1) is the number of staff with training, space, equipment and time for research. Between 1954 and 1959 the number of personnel with research training on the staff of schools almost doubled [1] – from 11 in 1954 to 21 in 1959. During the same period grants from the National Research Council to support dental research also doubled – from $38,000 to $78,000 (Table 7–2). At present there are about 14 full-time and 2 half-time members of the staff of dental schools with graduate degrees in one of the biological sciences in addition to a dental degree; there are also 20 full-time and 34 part-time staff with qualifications in one of the clinical specialties. Virtually all of those have additional basic science training and some of the others are engaged in research.

One of the most pressing problems facing dental education and dental research today is to obtain and retain trained personnel. Getting staff and keeping them involves a number of factors dependent to some degree on one another. First, efforts to recruit potentially able research workers must place emphasis on the undergraduate student body. It is from this group that most future teachers and research workers will emanate. As research programmes in the schools grow it becomes easier to interest young undergraduates in research as a career. Not many years ago research was something quite foreign to dental schools, and the thought of a career in dental research was equally foreign to dental students. Now, with research established and expanding in all schools, dental students have an opportunity to see research happening, to talk to those who do it, and to learn something about it. One development of particular significance to recruitment for research was the establishment in 1955 by the Canadian Dental Association, and later by the National Research Council, of awards to permit undergraduate dental students to obtain experience in a research laboratory during the summer months (Table 7–1). Some 96 such awards have been made. A number of the recipients have gone on to further study; a few of them are already on staffs.

The number of potential research workers graduating from dental schools is small. The total possible number of graduates from the six operating schools is 338 per year (Table 3–1). The ablest scholars among these are in the upper 10 to 20 per cent of the class. Thus the total pool from which candidates might be drawn is only about 65 per year when the schools are operating at maximum capacity. This same group of young graduates are also those who are urged to enter the specialties. With competition for spaces in specialty programmes as keen as it is, poorer applicants are unlikely to be admitted. Furthermore there is a real need for many of these more capable graduates in general practice, to provide the professional leadership, both local and national. Indeed, with so many opportunities available and with so much effort being expanded on recruitment into one career or another, it must sometimes be quite confusing for many of the students in the upper part of the class.

[1] Canadian Dental Association: *Transactions, 1960,* pp. 205–214.

Dental education has tended to assume that dental research workers have to be dentists first and then researchers, presumably because most non-dental research workers have evidenced relatively little interest in dental problems. Research in dentistry has now broadened to the extent that it includes a wide range of opportunities. In fact many non-dentist researchers in their own laboratories outside dental schools have become interested in dental problems. The field is sufficiently broad and exciting that it should offer good career opportunities to basic science graduates. The dental schools should look to this group as a possible source of strength for their research programmes rather than limit recruitment to their own student bodies. It is highly likely that if funds were made available for support, the science graduate would feel that dental schools could provide an excellent opportunity for a satisfying and useful research career.

Most future researchers in dentistry will be recruited from among graduates of the dental schools however. Once recruited the next problem is to arrange the place for training and then to find the money to help support the candidate. When a dental graduate undertakes study at the Ph.D. level in one of the basic sciences associated with dentistry, in order to obtain the best possible background in his discipline he should probably undertake his training in the basic science department in the university rather than in the dental school. In this way his experience will be broader than it could possibly be working solely in the dental school. Yet the research laboratories of the dental schools need graduate students. The severity of this dilemma depends partly on local arrangements and geographical location of the various departments of the university, and partly on the personal interest of the staff. It is difficult to imagine much of a problem in a university in which a centre in health sciences is organized and where the basic science departments and clinical departments form a geographic unit. In others perhaps dual sponsorship for graduate students with dental and basic science staff forming a small advisory committee would help solve the problem.

Of course not all those who wish to work in dental research either want to or are able to spend the time to acquire a Ph.D degree. Many want some research training to enable them to be more valuable as part-time teachers, or to do part-time research as a graduate assistant in a laboratory. Here is where a sound Master's programme can be of great value. Unfortunately there are not enough such programmes existing in Canadian dental schools and most candidates must go to the United States in order to obtain this experience.

Financial support in Canada for candidates training for careers in dental research comes from two sources, the Canadian Dental Association and the National Research Council. While no ceiling has been placed on grants from the Canadian Dental Association, the limited amount of money available and the need to distribute it as widely as possible have limited the size of grants to any one candidate to a maximum of about $2,500 in any one year. National Research Council Dental Fellowships may go as high as $5,000 per year, by Canadian standards a reasonable amount. Whether the Canadian standards are high enough to resolve the problems of recruitment into dental research is open to question however. There are circumstances in dentistry that do not apply elsewhere.

The young dentist who enters a programme of graduate study will lose more in unearned income than other professional graduates. In circumstances existing today the graduate in dentistry will make a good income during his first year of practice. His income will increase during the ensuing few years.[1] Money to support graduate study simply cannot equal income from general practice. To ask the dental graduate, who has just completed one of the most expensive courses in the university, to continue to make a greater than usual financial sacrifice in order to become a research worker and teacher, may be asking too much. It is argued that if a man is really dedicated to study the sacrifice will not be a deterrent. Sometimes this is used as a screening method to ensure idealism. But surely such a man should not have to prove his dedication by his willingness to go without. There are better ways of selecting candidates for research than by a demonstration of willingness to get along on less than his classmates. The number of those with high potential who do not apply for graduate study primarily for financial reasons is unknown but may represent a serious loss to dental education.

Many Canadian dental graduates look to the United States for training, either because inadequate facilities exist in Canada, or because of the particularly high quality of some U.S. programmes, or because of the value of experience in the different environment. Many Canadian graduate students are therefore studying side by side with American students in the United States. American students obtain considerably better support through fellowships which generally include an amount for fees. In many instances the school in which the candidate is studying receives a grant to help finance the research conducted by him as part of his training. Canadian students suffer by comparison in every respect, and are sometimes not particularly welcome in some institutions because of the lack of overhead support that goes with them.

Once a worker is qualified a new problem arises, finding space and funds for his support in the school in which he is to work. It is often very difficult to create new staff positions in dental schools, particularly when the universities are undergoing such great expansion in so many areas. With the increasing necessity to plan budgets far in advance, the problem of finding salary may be great, particularly for unexpectedly available potential staff. In addition, with the great shortage of staff already existing in the dental schools, the novice is inevitably expected to assume a heavy teaching load almost immediately on his appointment. This delays the start of his research programme, particularly in schools where equipped laboratories do not exist. Some help to alleviate this situation has recently been provided through the National Research Council. Regulations governing Associateships provided through the Associate Committee on Dental Research of the National Research Council have recently been changed to provide interim support for new staff members with research training until the school budget can be altered to include them. Far more such support could be used to great advantage in the schools.

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[1] Canadian Dental Association: "Survey of Dental Practice, 1958." *J. Canad. D.A.*, 25:638, 1959.

National Research Council Associateships also provide full-time support for career research workers in dental schools. Such awards have been available for only a short time and only one has been made in Canada. More appointments of this nature would provide a tremendous stimulus for dental research.

Finally, consideration should be given to a problem almost completely neglected, providing technical help for research workers. Most research technicians obtain their skills by on-the-job training. This is a costly procedure that can delay research, particularly in small laboratories where a busy and often lone researcher cannot always afford the time to train technical help. More programmes in technical institutes for training technical personnel for research would be of great benefit to all research.

RESEARCH FINANCING

Financial support for research in dentistry is obtained from a number of sources: the dental profession, government, universities, and private sources. The first three are the most significant in terms of the continued support required for long-term planning and development.

As was pointed out earlier, the first funds to support dental research in this country came from the profession. For almost 30 years after the First World War the limited income of the Canadian Dental Research Foundation was the sole source of extramural dental research support. Since 1945 the Canadian Dental Association has provided funds for the support of candidates undergoing training in research. The Association has provided well over $80,000 for this purpose (Table 7–1).

Government support for dental research is provided primarily through the National Research Council, on the recommendation of the Associate Committee on Dental Research, which was established for this purpose in 1945. National Research Council funds provide the largest single source for dental research support, and much of the growth over the last 15 years is due to the provision of these funds. Federal funds for dental research have also been provided through the Department of National Health and Welfare. The Federal Government has provided more than a million and a quarter dollars on dental research since 1945 (Table 7–2). The portion of this that has been used for both undergraduate and graduate student support is shown in Table 7–1.

The financial contribution to dental research by the universities is difficult to estimate. Figures of research overhead costs borne by the universities have been estimated at between 10 to 15 per cent of operating grants. From time to time granting bodies have considered providing a sum to the university for overhead along with each operating grant. This is done fairly commonly in the United States but not in Canada. It is difficult to justify inclusion of an item for research overhead for universities when research is so much a part of the university's business. While overhead costs for some kinds of research are greater than others, this should probably be compensated for in the general university budget.

If schools were forced to depend primarily on outside support for research overhead it is not improbable that, in spite of good intentions of the workers, the research would suffer. The more a school must depend on decisions of an extramural committee to ensure continued operation, the more the philosophy of the research programme and even of education in such schools sooner or later, consciously or unconsciously, becomes adapted to a preconceived idea of the requirements of the Committee. When that happens independence is lost and both research and teaching suffer.

Salaries for most research personnel should be paid by the university, but the responsibility of the university does not end here. The researcher must also be allowed time to do his research. The Survey of Dental Research in Canada conducted by the Canadian Dental Association,[1] and surveys elsewhere[2] indicate that, on the average, dental researchers have too little time in which to do research. An ideal percentage of the trained worker's time for research is difficult to determine. The Commision on the Survey of Dentistry in the United States[3] suggested that better research could be performed if more investigators spent at least one-fourth of their time in the pursuit of basic knowledge. This suggestion seems reasonable.

In addition to these three major sources of funds to support dental research, some money is also provided by industry and philanthropy. This support is generally related to individual projects. In 1962 about $50,000 was provided from such sources for all schools in Canada.

The financial needs for dental research are increasing as the programme grows. It has been estimated[4] that on the basis of a predictable increase in the number of dental research workers and an average spending of at least $15,000 per worker,[5] more than $1,500,000 will be needed to finance research projects by 1978. To this should be added an amount for student and for career investigator support, which at present is running about one-quarter of total research spending and is increasing. On this basis the total requirement for 1978 was estimated at about $3,000,000. The present upward swing in dental research spending tends to to support this (Figure 1).

Research spending will depend on the rate at which new facilities for graduating dentists are provided (Table 9–3). Assuming one-teacher-per-seven-students enrolled[6] and an annual spending of about $15,000 each[7] if no new schools are provided but all schools are successful in obtaining the staff they

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[1] Canadian Dental Association: *Transactions, 1960,* p. 211.

[2] Survey of Dentistry. *The Final Report.* Commission on the Survey of Dentistry in the United States. American Council on Education. Washington, D.C., 1961, p. 453.

[3] *Ibid.*, p. 454.

[4] *The Canadian Dental Association.* Brief submitted to the Royal Commission on Health Services. Ottawa, March 1962, App. XXIV, p. 7.

[5] Survey of Dentistry. *Op. cit.*, p. 466.

[6] World Health Organization: *Dental Education* . Report of an Expert Committee on Dental Health. Technical Report Series 244. Geneva: The Organization, 1962, p. 20.

[7] Survey of Dentistry. *Op. cit.*

require, just over $3,000,000 would be required for research by about 1980. Under a crash programme aimed at producing more than 400 additional graduates by 1971 (Table 9–3), and assuming staff could be obtained, more than $6,000,000 would be required by about 1975. If growth in output of dentists increases more moderately – at about 100 additional dentists each decade, approximately $3,500,000 would be needed for research support by 1976, about $4,500,000 by 1986, and $5,500,000 by 1991.

CHAPTER 8

AUXILIARY PERSONNEL

The term "Dental Auxiliary" is used in Canada to include all types of qualified auxiliary personnel who, working under the direction of the dentists, assist in providing dental health services. These include dental hygienists, dental assistants and dental technicians. Courses for assistants and technicians have been presented in the dental schools in the past. None is operating at present because of the high minimum educational requirements for entrance to the university. Technicians usually learn their trade through an apprenticeship in a commercial laboratory. Many assistants learn to perform their duties by on-the-job experience and instruction. Within the last few years evening courses have been organized for dental assistants through local dental societies. Ontario had seven such programmes in operation during the the winter of 1962-63, providing formal instruction for about 200 dental assistants.

The first course for dental hygienists in North America was started in 1914 in the United States at Bridgeport, Connecticut. The idea of the hygienist was slow to catch on and growth of additional programmes was far from rapid. The first Canadian course was begun at the Toronto dental school in 1951. For the next ten years this was the only one in this country. Because of limitations in space and staff during that time, class enrolment was less than ten per year. The new dental building at Toronto provides for a dental hygiene enrolment of 50 per year. Classes at Toronto are expected to reach this maximum enrolment within the next year or so. Courses are also now in operation at Alberta and Dalhousie (Table 8-1), and others are being planned.

Dentists have been slow to develop and utilize the services of auxiliaries. As late as 1958, 13 per cent of Canadian dentists worked with no assistants at all,[1] and another 3 to 4 per cent had only part-time help. Most had one assistant.[2] In the United States in 1955 almost 23 per cent of dentists had no assistant and more than half had only one.[3] In medicine numbers and utilization of auxiliaries have increased rapidly. In the United States there are approximately ten allied health

[1] Canadian Dental Association: "Survey of Dental Practice, 1958". *J. Canad. D.A.*, 25: 705, 1959.

[2] Canadian Dental Association, Bureau of Economic Research: "The Relationship of Dental Auxiliaries to Increased Productivity and Income". *J. Canad. D.A.*, 27(7): 446–448, 1961.

[3] Survey of Dentistry. *The Final Report.* Commission of the Survey of Dentistry in the United States. American Council on Education, Washington, D.C., 1961, p. 482.

workers for each practitioner in medicine.[1] It has been demonstrated that utilization of the services of auxiliaries will increase productivity and income for the dentist.[2] Only within the last few years however, has the dental profession given serious concern to the idea that expanding the utilization and services of auxiliaries can help create a wider distribution of dental services.[3] This professional concern has stimulated a rapid development in this field. All of the Canadian dental schools now have dental hygiene courses in operation or in the planning stage, and research is under way to learn how to expand the services hygienists can perform to be of more assistance to the dentist.

All Canadian dental hygienists and students in dental hygiene are female. Only one of the three schools offering programmes specifically stipulates that only female applicants will be considered, and whilst objection to such discrimination has been expressed,[4] it is generally accepted that the field of dental hygiene is a female domain. By practice and tradition dental hygienists are female and there seems to be no sound reason why this should change. The service hygienists perform is of a satisfying and useful nature and it is one which in some respects can be performed better over a longer period by women than by men.

Recruitment of dental hygienists has not been a serious problem. Until about 1960 no more than a dozen students could be accepted each year in Canada, and even with the recent expansion in both number and size of classes no difficulty has been experienced in obtaining a suitable number of desirable condidates. If the experience of the new programme for training dental auxiliaries in Great Britain can be used as an example, there appears to be a large number of girls who looks to service in dentistry as a desirable career. In this case the first class of 60 dental auxiliaries was selected from 1,100 applicants, although the very large number may have been in part related to the complete subsidization of the programme by the government (as in Alberta).

Of the class in first year dental hygiene registered in 1961-62, 11.6 per cent failed to advance to second year, not all for reasons of academic failure. This loss is somewhat similar to that experienced in the regular undergraduate dental course. As further data on academic failure rates accumulate, perhaps in the hygiene course it might become advisable to make some allowance for loss by admitting a few extra students to the first year.

With enrolment in dental hygiene in Toronto rapidly reaching its limit, and with courses under way at Alberta and Dalhousie, the present potential number of graduates is about 87 per year (Table 8-1). Manitoba is planning to have a course soon. When facilities can be provided at McGill and Montreal, courses will start there also. These, together with the proposed programme at the University of British Columbia, should increase the output of hygienists to about 150 per year within the next decade.

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[1] Royal College of Dental Surgeons of Ontario: "Future Dental Manpower Requirements and the Training and Utilization of Auxiliary Personnel". Report to Directors, Vol. VII: No. 1, January 31, 1962.

[2] Canadian Dental Association, Bureau of Economic Research. Op. cit.

[3] Canadian Dental Association: *Transactions, 1960*, p. 32.

[4] Royal College of Dental Surgeons of Ontario. *Op. cit.*

How adequate this will be in terms of the future practice of dentistry is difficult to say. Present indications lead one to believe that this number will not suffice and that facilities will have to be provided to make available many more auxiliaries than present or forseeable facilities will permit.

The basic purpose of the dental hygiene course is to provide a thorough background of knowledge in preventive dentistry, health education, and oral hygiene procedures. Other procedures such as the taking of X-ray pictures and making impressions for study models may be included in the course although this aspect of training varies somewhat from one school to another. The present general curriculum has been set up to serve the basic purpose outlined above.

TABLE 8-1

DENTAL HYGIENE ENROLMENT, CANADIAN DENTAL SCHOOLS, 1961–62 AND 1962–63

School	1961–62			1962–63		
	1st Year	2nd Year	Total	1st Year	2nd Year	Total
Alberta	20	–	20	22	19	41
Toronto	42	16	58	50	38	88
Dalhousie	8	–	8	12	5	17
Total	70	16	86	84	62	146

Students are admitted to dental hygiene after having met the general admission requirements of the university in which the school is located. It has been recommended[1] that the subjects for entrance emphasize the biological and physical sciences. The dental hygiene programme consists of two academic years of approximately 800 hours each for a total of about 1,600 hours (Table 8-2). As in the regular dental course, much of the emphasis of the first dental year is on basic science subjects and in the second year on clinical subjects and experience. Also, as with the regular dental course, about one-fourth of the time is devoted to acquiring the clinical experience and operating skill and speed necessary for licensure. The basic course content to be found in the dental hygiene programme is shown in Table 8-2. These are the subjects proposed by the Council on Education of the Canadian Dental Association.[2] The list does not contain all of the courses that might be included.

The Canadian Dental Association Council on Education has been careful not to specify the minimum hours required for each course and has wisely left this to the discretion of the schools. The total of 1,600 hours suggested by the Council is considerably in excess of the 1,200 hours listed as minimum requirements by the American Dental Association Council on Education for the United States dental hygiene schools.[3]

[1] Canadian Dental Association: *Transactions, 1962*, p. 55.

[2] *Ibid.*, p. 56.

[3] Survey of Dentistry. Op. cit., p. 184.

TABLE 8–2

DENTAL HYGIENE CURRICULUM,[1] CANADIAN DENTAL SCHOOLS, 1962

	Courses		Approximate Hours of Instruction
Basic	Anatomy	Bacteriology	
	Biochemistry	Dental Histology	
	Dental Materials	Nutrition	550
	Pathology	Pharmacology	
	Physiology	Psychology	
	Sociology		
Clinical	Clinical Practice	Dental Hygiene	
	Dental Prophylaxis	Roentgenology	800
Miscellaneous	Dental Public Health		
	English Literature and Composition		
	Library and Office Procedures		250
	Total Hours		1,600

[1] Canadian Dental Association, *Transactions, 1962*, pp. 55-56.

It appears that, in general, the dental hygiene curriculum serves its purpose reasonably well and that its graduates become highly skilled during their training periods. Indeed the question has arisen whether hygienists are not being overtrained for the limited duties they are permitted to perform. The Commission on the Survey of Dentistry of the United States in 1958 stated[1] "Although the Commission is sympathetic with the desire to improve the educational experience of hygienists, it appears that the two-year curriculum for hygienists may be over-educating them for the services most hygienists actually perform. The two-year programme should permit hygienists to acquire a background that would enable them to perform a number of services under the direct supervision of dentists, comparable in degree of responsibility to those entrusted to nurses. As mentioned in the preceding chapter (Dental Health) some nurses practise with a minimum of two years training. Certainly, two years of training are not needed to prepare for the cleaning and polishing of the exposed surfaces of the teeth. Dental Corps men in the armed forces are trained within a few weeks to provide this service".

In view of the need to broaden auxiliary service for dentistry, consideration has been given to expanding the usefulness of hygienists by adding to their course. If the dental hygiene programme were to be broadened in scope, in which direction should additional training go? Should it try to present an even broader background in prevention, or should the training add a wider scope of technical service?

It is doubtful if more could be constructively added to the programme in preventive dentistry taught hygienists without markedly increasing their background in

[1] *Ibid.*, p. 204.

basic sciences. This could not be done without demanding more pre-dental hygiene training. Such a move could not be justified unless the hygienists were to assume more responsibility for the preventive aspects of dental practive than at present. There is surely a limit as to how much of this extremely important part of dentistry should be left to auxiliairies. Prevention above all else in the practive of dentistry offers the most hope for a healthy future. The Minister of Health in New Zealand observed years ago[1] that if that country had invested more money in preventive dentistry, an improvement in the dental health of the whole population of New Zealand, far greater than that related to the programme of repair they undertook, would have resulted. Prevention is surely one aspect of dental service it would be folly to overlook, and it is one that dentists themselves should be emphasizing. Prevention of dental disease is one aspect of dental service that requires a particularly sound background of biological science in order to understand, appreciate and develop. Thus, unless the hygienist were to be given a background in basic science at least equivalent to that which the dentist acquires, and unless she were to assume greater responsibility for prevention in dentistry, there is little justification in expanding her programme much further in this direction.

There is sound reason, however, to believe that dental hygienists could be trained to perform more advanced technical services. The Royal Canadian Dental Corps has recently published an interim report of a study on the effectiveness of expanding clinical services performed by a dental clinical technician[2]. Experience with one particularly able individual has led to the belief that individuals equivalent to dental hygienists can be further trained in a reasonable time to perform a number of services in restorative dentistry and prosthodontics that will significantly contribute to the work output of the dentists in the Corps. The Corps proposes to train more technicians over a fourteen-week period (492 hours) to enlarge the scope of their services in the field of operative and prosthetic dentistry. Results of this experiment to date are encouraging and further developments should be followed very closely.

It is surely absurd to contend that girls do not have the ability to develop fine technical skills within a reasonable period of time. After all, women do practise dentistry and do it well; they are employed in many other occupations requiring technical skill. The experience in dentistry in New Zealand since 1921, and more recently in England, has clearly demonstrated just how quickly and how well girls can learn the technical skills required for the practice of operative dentistry.

Dentistry on this continent is just beginning to explore the possibility of making wider use of auxiliaries. There has been and still is a reluctance on the part of many even to explore the idea let alone accept it, in spite of the fact that auxiliary help will increase the work output and income of the dentist.[3] The policy of the Canadian Dental Association with respect to the projection of dental services in Canada is singularly enlightened and recognizes a need to extend the ser-

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1 Ellis, R.G. *Report on Dental Health Services in New Zealand and Australia.* Canadian Dental Association, 1951.

2 Baird, K.M., Shillington, G.B., and Protheroe, D.H. "Pilot Study on the Advanced Training and Employment of Auxiliary Dental Personnel in the Royal Canadian Dental Corps". Preliminary Report. *J. Canad. D.A.*, 28 (10): 627-638, 1962.

3 Canadian Dental Association, Bureau of Economic Research. *Op. cit.*

vices that hygienists may be permitted to perform. Some exploration of the possibilities is now under way in Canada. At Alberta the dental hygienists' programme includes some simple techniques not routinely included in such courses. At Toronto a controlled study is under way to measure the degree of success with which hygienists can learn technical skills by comparison with the success of dental students in learning the same skills.[1]

A discussion of auxiliary services for dentistry would not be complete without reference to two special programmes for training auxiliaries, namely the New Zealand Dental Nurse Plan and the British Dental Auxiliaries Plan. The latter programme has been patterned somewhat after the former but designed to compensate for certain deficiencies in the New Zealand plan. It appears to be a significant experiment in the field of training and utilizing auxiliaries in dentistry.

Training New Zealand dental nurses began in 1921 in a school under the direction of the Ministry of Health for New Zealand. A two-year course was offered in which young women with a background of training slightly less than that required for admission to Canadian dental hygiene courses learned the skills involved in routine restorative dentistry for children. Graduates serve in the extensive state school dental service in New Zealand. They cannot work outside the service.[2] The nurses work independently and their work is inspected infrequently. Regulations of the service require a minimum of three inspection tours per year by the district dental officer.[3] No dentist is readily available to deal with problems of oral health other than tooth decay that may be present in the children. Nurses insert restorations and perform extractions and prophylaxes for school children. The New Zealand dental nurse is a good operative technician and her skill in performing the services for which she is trained is of high quality. The major criticism of the New Zealand scheme, and the reason why it has not been readily adopted elsewhere, is related to the fact that they work alone with no dentist to guide and advise them. This lack of supervision places a responsibility on the nurse for the diagnostic and preventive service for which she has not been trained. In other areas in the world where a similar scheme has been tried, it has been the demand for service beyond the training of the auxiliary that has led to failure.

Since New Zealand dental nurses do not work as a member of a health team with dentists, dentists do not contact the children until they are nearly through school and have left the school dental service. In other words, the responsibility for that part of dental treatment which has the most to offer in terms of future dental health for the individual – dentistry for children – has been entrusted almost entirely to auxiliaries in New Zealand. Apparently a dentist-child contact has an influence in creating a desire to continuing dental care as adults. In Sweden with a high dentist-population ratio a comprehensive school dental service is provided by dentists until the age of fifteen. It was recently reported that five years after leaving the service 43 per cent of young army recruits still sought regular care.

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[1] Royal College of Dental Surgeons of Ontario: *Proceedings*. April 1962, p. 27.

[2] Fulton, J.T. "Experiment in Dental Care. Results of New Zealand's Use of School Dental Nurses". World Health Organization: Monograph Series. Geneva: The Organization, 1951, p. 25.

[3] *Ibid.*, p. 27.

This percentage had increased from 11 per cent in 1942.[1] In New Zealand, after 40 years of a school dental service providing good technical treatment but little professional contact, no such record is apparent.[2] Presumably the professional contact has made the difference.

In England an experiment was begun about two years ago to train dental auxiliaries in the skills of the New Zealand dental nurse.[3] The scheme in England has been designed to require service from the auxiliary commensurate with the skills and knowledge she has learned in training. It should also provide a patient-dentist contact not found in New Zealand. A school for training the auxiliaries has been built in the grounds of the New Cross General Hospital, London, England, with funds provided by the Ministry of Health. The school accommodates 60 students per year who are completely subsidized by the government for costs of fees, uniforms, instruments, and subsistence. The first class of 60 students was accepted in 1960.

The curriculum in the British school for dental auxiliaries is quite similar to that for the New Zealand dental nurse. The course extends over two calendar years. Girls are taught to prepare cavities and place fillings in the teeth of children under strict and comprehensive pre-clinical and clinical supervision. During the course students are taught the value of dental health education. Instruction to patients on self-care is an important part of the service performed. Patients are drawn from the neighbouring schools. The quality of the technical work and the spirit and morale of the school are extremely good.

The significant difference between the British experiment and the plan in New Zealand is that the British dental auxiliaries will not be required to work alone. They will be employed in established community school dental clinics where they will continue to work as they have been trained, under close and continuous supervision of dentists. If this arrangement is found to work out as planned over the next few years, it may, by removing one of the major objections to the New Zealand system, pave the way for a more general incorporation of such auxiliaries into dentistry. The first class of auxiliaries graduated in the summer of 1962, so that insufficient time has yet elapsed to evaluate the impact of the scheme on the provision of dental service in Great Britain. The study is imaginative and well-designed and should be followed carefully as it proceeds. It is to be hoped that it does not weaken the contact between the child patient and the dentist that seems so important to continued dental health.

How far is the pattern of utilization of auxiliaries in dentistry likely to develop? No ready answer to this question is available, although it will surely be much more extensive than at present. Current and future studies in this field will provide it. To obtain the right answer – the one in the best interests of national health – time will be required. People do not object to administration of service by auxiliaries when a dentist or doctor recommends it in a private office, clinic, or hospital.

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[1] Gullett, D.W. Personal communication, 1962.

[2] Gruebbel, A.O. *A Study of Dental Public Health Services in New Zealand.* American Dental Association, 1950, p. 55.

[3] Bingay, J.V. "The Training School for Dental Auxiliaries". *Brit. Dent. Jour.*, 109: 178-180, 1960.

Some even accept it without professional approval, and from individuals completely without training. This is exemplified by the success so-called "Denturists" have in some parts of Canada in attracting a clientele. Local paucity of regular dental service has probably contributed much to the continuance of their activities. In any case the administration of a health service by individuals with no formal training or whose knowledge has never been demonstrated by examination, is certainly not in the best interests of health. It is reminiscent of dentistry in this country in the last century.

As it becomes demonstrated through study that more technical service can be safely and usefully carried out by trained and closely supervised auxiliaries, they will be incorporated into dentistry. The problem is not to determine simply what assignments may be technically carried out by auxiliaries; it also involves determining which of these will be of most value in rendering dental service to the public. It is not enough just to provide more dental service to more people. The service provided must be of the highest possible quality. Anything less than this is not in the best interests of the public health.

How many types of auxiliaries are likely to develop in dentistry will also have to be determined by time and experience. There is no doubt that the present dental hygienist could be taught more in the time she spends in training. If the period of instruction were to be extended over two calendar years with a reasonable holiday period between, hygienist training could be far more extensive than at present. In the school for British auxiliaries the feeling was expressed that two calendar years were quite adequate to bring their fairly complex operating skills up to the desired standard. There was even some doubt whether quite so much repetition in certain phases of training was entirely necessary.

Experience in training auxiliaries in the field of prosthetic dentistry is exremely limited, so that it is therefore difficult to know just what would be required. Many of the steps in denture-making could be learned quite quickly. For the moment studies are centred on extending the services hygienists can perform in operative and prosthetic dentistry. Until the possibilities in this area have been fully explored, it would probably be remiss to consider training additional types of auxiliaries.

How many auxiliaries will be needed in the future is not known. In New Zealand the aim has been to provide one dental nurse for every 500 children enrolled in the school dental service.[1] Whether the same number will be required under the system presently being studied in Great Britain in unknown. As treatment centres for dental service become established in this country large numbers of auxiliaries will probably be required. One dentist should be able to supervise adequately the work of several auxiliaries.

Whether the expansion of services and training of auxiliaries will involve a great expansion of facilities in the dental schools will depend on future circumtances. How large a role the university should play in developing technical skills and providing training for auxiliaries in dentistry should be given careful consider-

[1] New Zealand School Dental Nurses. Report of United Kingdom Dental Mission to the Ministry of Health, Department of Health for Scotland, Ministry of Education, London, 1950, p. 10.

ation. It is not the concern of the university to develop technical skill; it is the business of the university to impart the knowledge and mental attitudes necessary to make the skills meaningful, and to conduct research into the development of new and better programmes tor improving the knowledge and skills. Here again we face the paradox associated with dental education. In the case of the dental auxiliary the university should provide the basic background of science and develop an understanding of the principles involved in treatment. It should not be the responsibility of the universities to supervise the repetitive procedures required for obtaining a minimum of skill and efficiency. At present however the only place where the latter can be done under adequate supervision in Canada is the dental school clinic. When and if hospital dental clinics are provided or expanded as teaching units, the university dental school clinic will be able to drop much of its responsibility in this respect. In the meantime, in the absence of other training facilities, the schools will have to carry on with this function.

CHAPTER 9

FINANCES

REVENUE AND EXPENDITURE

Variations in the pattern of budgeting between dental schools in Canada render a simple list of costs of education in each school quite misleading. Most dental schools do not budget for overhead costs such as heat, light, and building maintenance. This item is usually taken care of in the general university budget. At Dalhousie University however, the dental school budget does include an item for overhead costs which almost doubles the apparent cost of dental education in that University, and raises it considerably above that of the others. In fact the Dalhousie figures are probably the most accurate in the country in terms of total education costs.

In all schools except McGill the dental clinic is considered part of the dental school and costs of clinic operation are included in the general school budget. Clinic income is considered general university income, and is not considered in dental school budgets.

At McGill the dental clinic is an out-patient department of the Montreal General Hospital and clinic costs and income become part of the hospital accounting and do not enter into dental school estimates. This makes the budget for operation of the dental school at McGill lower than the others by about 50 per cent when the number of students involved is taken into consideration.

In Manitoba the staff/student ratio is considerably higher than at the other schools and this raises the cost of dental education per student in that school higher than others If original proposals for the dental school at the University of British Columbia[1] are carried out, U.B.C. costs will be approximate to those of Manitoba.

All of these factors, and possibly others, make comparison of the individual figures from schools subject to misinterpretation. When figures were adjusted in an effort to compensate for the differences mentioned above, there appeared to be no geographic difference between schools except possibly that due to minor variations in salary scales. Therefore, for the purposes of this report costs were pooled to show the Canadian total and averages (Table 9–1 and 9–2).

[1] Macdonald, J.B. *Dental Education in British Columbia.* University of British Columbia, 1961.

TABLE 9–1

DIRECT COSTS OF DENTAL EDUCATION, ALL SCHOOLS, CANADA, 1961–62

Total Allocation from Universities		$2,520,000
University Income from Dental Schools:		
Dental Student Fees	$545,450	
Hygienist Fees	30,750	
Total Fees	$576,200	
Clinic Income	200,000*	
Total Income		$776,200
Net Cost to Universities		$1,743,800

*Not including Manitoba or McGill.

None of the dental schools shows an excess of revenue over expenditure. All estimate their needs in advance and submit a proposed budget for approval.

The total basic allocation to the dental schools in 1961-62 by the universities was $2,520,000 (Table 9–1), of which approximately 80 per cent was spent on salaries (55 per cent for academic personnel and 25 per cent for non-academic staff). The remaining 20 per cent was used for supplies, stationery, and so forth.

The additional indirect costs to the universities for dental schools cannot be estimated with accuracy. As was pointed out, at Dalhousie the basic dental school appropriation has to be almost doubled to include overhead costs. It is probably reasonable to apply the same formula to all schools. This would raise the total cost of dental education for 1961-62 to a little more than $5,000,000.

The cost of dental education per dental student for Canada in 1961-62 is shown in Table 9–2. Not including hygienists or graduate students, the average cost exclusive of overhead was $2,400, considerably less than the $3,000 per student reported for the United States 1958-59.[1]

The figure of $3,000 per student seems to be a fairly realistic figure in terms of what should be now spent in Canada. If the Manitoba school were at full enrolment with the present staff and general cost, the expenditure cost per student would be about $3,300. This is comparable to the cost proposed by Macdonald[2] for the dental school at the University of British Columbia. If the present schools now had the 80 additional academic staff they need, on the basis of an average salary of $10,000 a year for this group, and including a proportional amount for the extra non-academic staff that would be required and for supplies, the total basic cost of dental education in Canada would be about $4,000,000 per year. Under these circumstances and assuming all classes full, the annual cost per dental student would be approximately $3,000.

[1] Survey of Dentistry. *The Final Report.* Commission on the Survey of Dentistry in the United States. American Council on Education. Washington D.C., 1961, p. 373.

[2] Macdonald, J.B. *Op. cit.*

Figures on the cost of training dental hygienists cannot be separated from the general dental school budget. If costs for this group are similar to those for dental students, the number of hygienists enrolled in 1961-62 may be added to the number of dental students. The cost of dental education in Canada would thus appear as $2,200 per student in 1961-62 (Table 9–2).

There are no data available on the cost of graduate and postgraduate training in the dental schools. As close as it can be estimated in the two schools where this type of instruction is given, costs per postgraduate or graduate student are about $7,000 per year or about three times that for undergraduates. With only a few postgraduate and graduate students enrolled in available courses, small variations in numbers enrolled would create large fluctuations in this sort of cost estimate. For some courses with only one or two students enrolled costs may well approach $10,000 per student per year.

All aspects of dental education are expensive. Recognition of this fact is reflected in the resolution which emanated from the National Conference of Canadian Universities and Colleges held in Ottawa in November 1961.[1] This resolution requested the Federal Government to make a special grant to universities of $500 per medical, dental and graduate student enrolled.

TABLE 9–2

AVERAGE BASIC AND NET COSTS OF DENTAL EDUCATION PER UNDERGRADUATE STUDENT ENROLLED*, CANADIAN DENTAL SCHOOLS, 1961–62

Basic University Allocation (Table 9–1)	$2,520,000	
Basic Cost per Dental Student		$2,400
Basic Cost per Student Including Hygiene		$2,200
Net Cost to University (Table 9–1)	$1,743,800	
Net Cost per Dental Student		$1,700
Net Cost per Student Including Hygiene		$1,550

*Enrolment — Dental Students 1,048
— Hygienists 86

SOURCES OF FUNDS

None of the dental schools has private sources of income. They all rely solely on general university appropriations for the entire support for teaching and for part of the support for research. The total extramural funds from all sources to finance research projects in the dental schools in 1961-62 was about $157,000, and came mostly from the Federal Government. This money was used to pay some salaries for technical staff whose duties related solely to research, and to purchase supplies and equipment for the continuation of research projects. It cannot be considered as assisting directly in teaching costs. The amount shown does not include fellowships or grants to departments outside the dental schools.

[1] Rodgers, R. "Higher Education: Crisis and Contradiction". *The C.A.U.T. Bulletin*, 10:5–8, 1962.

The general support for dental education is through regular provincial grants to universities. This creates a problem, particularly in some areas. As noted below, fees fall far short of covering the cost of educating a student. Thus provinces with schools heavily subsidize the provision of dental services for those provinces without schools by training dentists for them. The problem is particularly acute for "regional" schools whose responsibility for providing dentists extends far beyond their own provincial boundaries. For example, until a few years ago Alberta was the only school west of Toronto, and it had an obligation to British Columbia, Saskatchewan and Manitoba in addition to Alberta. With the new school now established in Manitoba, and a new one starting in British Columbia, the situation has eased. The only western province not served by its own school will be Saskatchewan, which will continue to rely largely on Alberta and on Manitoba for its supply of dentists. The problem still remains acute in the Atlantic Provinces. Dalhousie may now be considered the only really "regional" school in the country (Table 5–5) with a responsibility to all four Atlantic Provinces. In 1961-62 there were more students from the other Atlantic Provinces registered in Dalhousie than there were from Nova Scotia. Since New Brunswick, Prince Edward Island and Newfoundland do not subsidize Dalhousie adequately for the training of students from their provinces, an extra financial burden is placed on Nova Scotia.

The average university fee per year for dental students is about $475 and the range is from $425 to $600. For hygienists the average fee is $365 per year, with a variation of from $290 to $435. In 1961-62 the total university income from dental students' fees was $545,450 and from hygienists $30,750 for a total of about $576,000 (Table 9–1). All fees went directly to the university.

In addition to this income the fees collected from patients treated in dental school clinics are turned over to the university. At McGill the dental clinic is part of the Montreal General Hospital, to whom the dental fees are paid. In 1961-62 no figures on clinic income were available from Manitoba, since this was the first year that both a senior and junior class were operating in the Manitoba clinic. For the others the total clinic income was about $200,000, about $550 per third- and fourth-year student. This figure varies considerably from school to school depending on the time the students are free and required to work in the clinic, and on the local fee schedule. Thus the total net cost to the universities (exclusive of overhead costs) in 1961-62 was nearly $1,744,000, $1,700 per dental student or $1,550 per dental and hygiene student (Table 9–2).

The universities recovered on the average about 23 per cent of their basic dental school allocation from student fees, and about 10 per cent from clinic income. The amount recovered from fees varies from 10 to 47 per cent, and clinic income from 6 to 16 per cent. Clinic income should never be considered as other than a by-product of dental education. Pressure on dental schools to increase income from this source would lead to a serious degeneration of the quality of clinical teaching in the schools, where quality of student performance should always take precedence over quantity.

FUTURE ESTIMATES

It is hazardous to predict future dental education costs because a number of factors will have unknown effects on the need and demand for dental services. Dental research offers the hope that within a reasonable time some aspects of dental disease will be largely preventable, although when and how this may come about is unforeseen. On the other hand, there is the indication that as dental health education programmes expand and as availability of dental services improves, an increased demand for dental care occurs. The ultimate magnitude of this increase for Canada cannot be estimated.

The expansion of services that auxiliaries may be able to perform in dentistry will also affect the availability of dental service, and therefore the demand for it. It may also reduce the need for dentists to a level that is attainable. Some indication does exist that utilization of auxiliaries under the conditions of present private practice in dentistry does permit more patients to be served.[1] There is no information at all on what impact an operative or prosthetic auxiliary might have either in private practice or in public clinics. The effect any or all of these factors will have on the need for dentists in the future is not known. It follows therefore that the magnitude of the facilities that will be required for dental education cannot be predicted with any degree of certainty. Several possibilities can be considered however.

In preparing the present estimates the unknown influence of the factors mentioned above has not been taken into consideration. It has been assumed that the dentist himself will render almost all treatment service as he does today, and that no further advance in prevention of disease will occur. With these assumptions the problem of the future needs for dentists can be considered in three possible ways. We can view the results if we were to continue providing dentists at today's rate with no further expansion in dental education facilities. We could organize a "crash programme" to provide the maximum number of dentists in the shortest possible time with a view to arriving at some ideal number as soon as possible; or we could consider the results of expanding dental education facilities at a reasonable and practical rate for the next 25 to 30 years.

The effect of all three plans, including two possibilities under the third, are shown in Table 9–3 and Figure 2 as they will affect the dental population and the dentist/population ratios. Projected costs are shown in Table 9–4.

Population predictions are shown as projected by the Royal Commission on Health Services on the basis of a net immigration of 50,000 per annum. The increase in dentist population was predicted after the method used by the Canadian

[1] Canadian Dental Association: "Survey of Dental Practice, 1958". *J. Canad. D. A.*, 25:773. 1959.

TABLE 9–3

ESTIMATED DENTAL POPULATION AND DENTIST-POPULATION RATIO ACCORDING TO METHOD FOR EXPANDING FACILITIES FOR DENTAL EDUCATION, CANADA, 1966–1991

Year	Estimated Population Net Immigration 50,000/Year	Plan For Increasing Dental Population											
		I. No New Schools			II. 410 Additional Graduates by 1971			III. 100 Additional Grads Each 10 Years			IV. 50 Additional Graduates Each 5 Years		
		No. Grads/ Year	Number** Dentists	Ratio Dentists: Pop.	No. Grads/ Year	Number** Dentists	Ratio Dentists: Pop.	No. Grads/ Year	Number** Dentists	Ratio Dentists: Pop.	No. Grads/ Year	Number** Dentists	Ratio Dentists: Pop.
1966	20,296,500	338	6,700	3,030	338	6,700	3,030	338	6,700	3,030	338	6,700	3,030
1971	22,589,500	378*	7,820	2,890	788*	8,270	2,730	478*	7,920	2,840	428*	7,870	2,860
1976	25,233,500	378	9,020	2,800	788	11,720	2,150	478	9,620	2,620	478	9,370	2,700
1981	28,246,700	378	10,220	2,760	788	15,170	1,860	578	11,420	2,470	528	11,120	2,540
1986	31,545,900	378	11,420	2,760	788	18,620	1,690	578	13,620	2,310	578	13,120	2,400
1991	35,106,700	378	12,620	2,780	788	22,070	1,590	678	15,920	2,200	628	15,370	2,280

* Includes 40 graduates from University of British Columbia Dental Faculty, beginning 1969.

** Based on same formulation as that used by The Canadian Dental Association, brief submitted to the Royal Commission on Health Services, 1962, Appendix XX pp. 6–8.

TABLE 9–4

ESTIMATED CAPITAL* AND OPERATING** COSTS FOR DENTAL EDUCATION DEPENDING ON METHOD FOR EXPANDING TEACHING FACILITIES, CANADA TO 1991

Year	Plan For Increasing Dental Population							
	I. U.B.C. First Full Class 1969 No More New Schools		II. Immediate Large Expansion		III. 100 Added Graduates Each 10 Years		IV. 50 Added Graduates Each 5 Years	
	Capital Costs	Operating Costs/Annum	Capital Costs	Operating Costs/Annum	Capital Costs	Operating Costs/Annum	Capital Costs	Operating Costs/Annum
1971	$3,200,000	$4,536,000	$36,000,000	$9,456,000	$11,200,000	$5,736,000	$7,200,000	$5,136,000
1981	–	4,536,000	–	9,456,000	8,000,000	6,936,000	8,000,000	6,336,000
1991	–	4,536,000	–	9,456,000	8,000,000	8,136,000	8,000,000	7,536,000
Total	$ 3,200,000		$36,000,000		$27,200,000		$23,200,000	

*Capital costs at $20,000 per undergraduate student.

**Operating costs at $3,000 per undergraduate student.

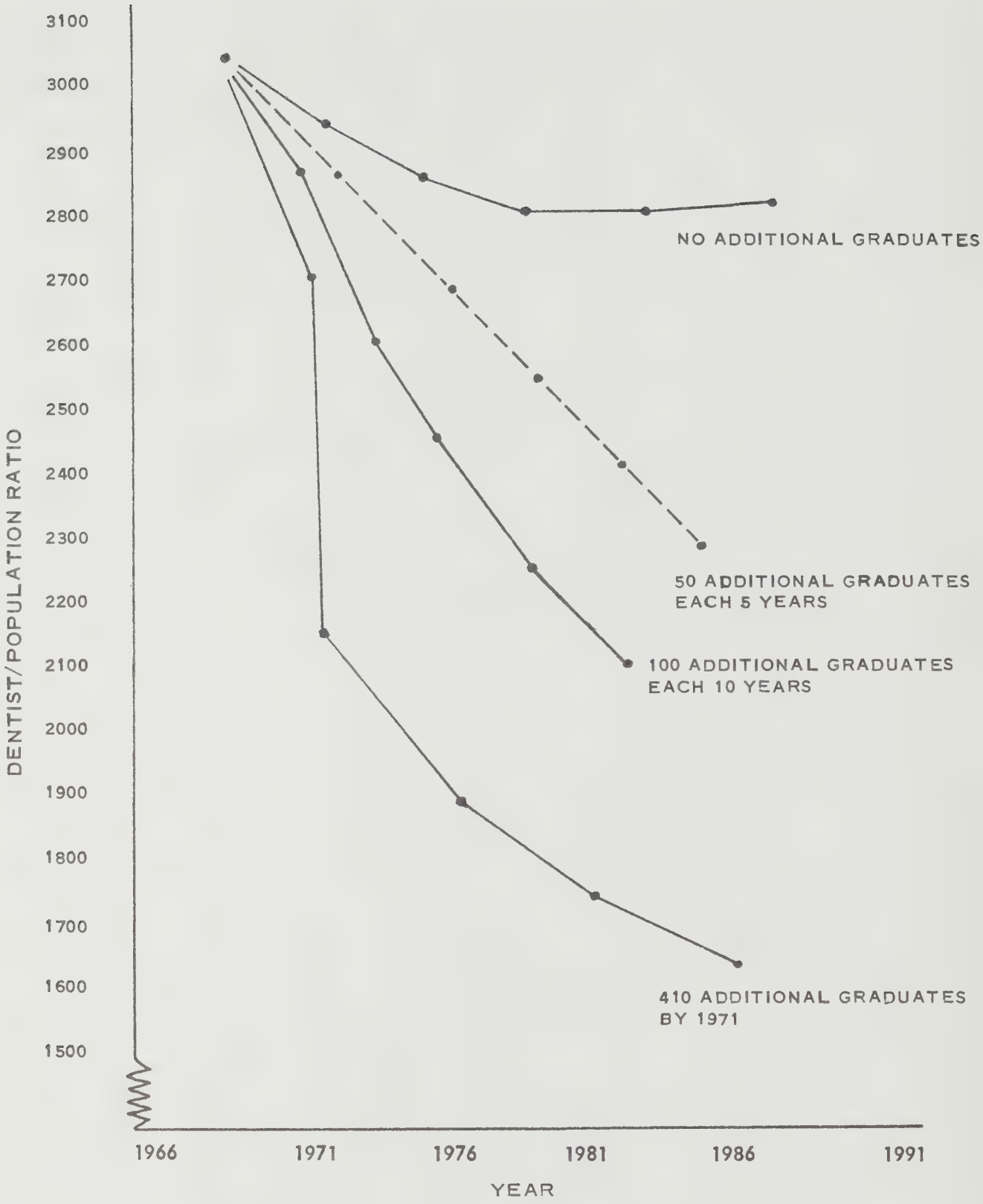

Figure 2. The ratio of dentists to population in Canada from 1966 to 1991 according to method of providing additional facilities for graduating more dentists.

Dental Association.[1] It was also assumed that all dentists graduating between 1961 and 1991 survived until the latter date. Capital costs were estimated at a rate of $20,000 per undergraduate student, which is a reasonable figure based on experience over the last few years. Operating costs were estimated at $3,000 per undergraduate student, the current cost if the schools were staffed as they should be, and comparable to the cost in the United States in 1958.[2] No consideration has been given to possible increase in building costs, or academic salaries, or to decline in the value of the dollar.

The effect of providing no more facilities for dental education is shown in Table 9–3 (I). Assuming the University of British Columbia graduates its first full class in 1969, the dental population would increase by about 240 per annum from the population of 6,700 estimated for 1966 by the Canadian Dental Association.[1] For a few years the addition of this number would have the effect of improving the dentist/population ratio slightly but in the early 1980's the growth rate of the general population would catch up to that for dentists and by 1991 the ratio would become worse (Figure 2). Since each dentist can treat only about 1,000 patients per year on the average,[3] service would continue to be available to little more than one-third of the population. That is, by 1991 the 12,620 dentists could provide service for 12,620,000 people out of a total population of 35,106,700. This policy would involve a capital expenditure of something in the order of $3,000,000 for the University of British Columbia, and a continuing operating cost for all schools of about $4,500,000 (Table 9–4).

If a "crash programme" were adopted to bring the dentist/population ratio as close to the ideal as possible in the shortest possible time, an ideal ratio must be decided upon. This is not easy to decide absolutely, although some reasonable estimates might be reached. On the basis of the number of patients who can be seen by a dentist each year[4] the ratio should be 1:1,000 in order to have service available to all. Even in those countries where dental service is available to everyone through a health service, not all seek it. In both Norway and Sweden where extensive state care programmes have been in operation, the dentist/population ratio in 1957 was about 1:1,600.[5]

Hastings[6] recommended a dentist/population ratio of from 1:1,500 to 1:1,800 in the plan for health care proposed for labour. Therefore for purposes of the present report it has been assumed that a ratio of 1:1,600 by 1991 would approach the ideal. To do this would require that by 1971 an additional 410 dentists should be graduating each year in addition to those that will be provided by the dental school of the University of British Columbia (Table 9–3). This would necessitate

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[1] *The Canadian Dental Association.* Brief submitted to the Royal Commission on Health Services. Ottawa, March 1962, App. XX, p. 6.

[2] Survey of Dentistry. *Op. cit.*

[3] Canadian Dental Association: "Survey of Dental Practice, 1958". *Op. cit.*

[4] *Ibid.*

[5] Gullet, D.W. *Notes on Dentistry in Europe.* Canadian Dental Association, 1957.

[6] Hastings, J.E.F. *Labour's Plan for a Medical Care Program for Toronto.* Toronto Labour Health Centre Organizing Committee, 1962, p. 22.

providing a capital outlay for buildings and equipment of about $36,000,000 by 1971 and at the same time it would raise operating costs to almost $9,500,000 per year.

Even if these large sums could be provided for this purpose the impracticability and undesirability of such a programme is obvious. The present shortage of full-time teachers in the schools is a serious problem which needs to be solved. To try to more than double student output in such a short time would only compound the staff problem. It would require more than 250 additional full-time staff over and above the present need. Such personnel simply do not exist nor could they be trained within such a short time. Furthermore while a "crash programme" would improve the dentist/population ratio to what appears reasonable by 1991, it may very well overshoot the goal (Figure 2). Once committed to such a programme, the pattern would have to continue for many years, and if, because of research findings or expansion of auxiliaries, it were found advisable to revise estimates of the needs for dental personnel, nothing short of closing or converting dental schools would permit suitable adjustment. Thus the limitations of a "crash programme" are obvious, and it is included here simply for illustration.

The third approach to the problem of providing dental services is to expand dental schools at a reasonable rate compatible with possible provision of funds and within the possibilities of finding staff. This has been considered in two ways. first by providing facilities for increasing the number of graduates by 100 each decade.1971, 1981, and 1991. This would improve the dentist/population ratio from the present 1:3,000 to about 1:2,000 by 1991 – still short of ideal but considerably better than at present and on the way to continued improvement (Table 9–3, Figure 2). The second way is to consider expansion in smaller but more frequent increments, i.e., 50 new graduates every five years beginning in 1971. This would also improve the dentist/population ratio significantly, although not quite to the same degree as the former suggestion. The small difference in end result indicates that the size of the actual additions is not too important. The plan for smaller, more frequent additions provides for reasonable expansion of existing schools, together with provision of some new ones. This is probably more realistic because it will not always be possible to provide only large schools. Either way the capital cost for buildings would be in the order of from $23,000,000 to $27,000,000 spread over about 25 years, and operating costs would increase to between $7,500,000 and $8,000,000 during the same period.

Of all the possibilities considered, planning 50 new graduates every fifth year seems most ideal. The cost increments are the most acceptable and such a programme offers the greatest flexibility in accommodating to research findings, to the development of dental care plans, and to the provision of auxiliaries. The programme could most easily be speeded up or slowed depending on the need for dentists

It must be emphasized that the figures used for estimating the costs shown in Table 9–4 are based on reasonable values as of today. The Commission on the Survey of Dentistry for the United States estimated that by 1970 the cost of education for dental students may have increased to $5,000, and that it may go as

high as $6,000.[1] If these predictions are correct, operating costs for dental education would be roughly double those shown for 1971 in Table 9–4 and they may go still higher for later years. Further upward adjustment will no doubt be necessary as training programmes for auxiliaries increase. No account has been taken of such costs in the present estimates.

Probably capital costs for building and equipping dental schools should be shared on a 50–50 matching grant basis by the federal and provincial governments. This seems reasonable in view of the large sums involved and the nature of the service rendered to the country as a whole through dental education.

It would be proper to consider sharing operating costs as well. The dental student population in any school is not limited to residence in the province in which the school is located, and indeed in some schools the extra-provincial registration may equal or even exceed that from the home province (Table 5–5). On the average for all dental schools about 27 per cent of undergraduate students registered come from provinces other than that in which the school is located and about one-third of the graduate students registered come from that province. On this basis it would be fair to think of the Federal Government bearing from one-quarter to one-third of the operating costs of dental schools.

[1] Survey of Dentistry. *Op. cit.*

CHAPTER 10

FUTURE OF DENTAL EDUCATION IN CANADA

SUMMARY OF PRESENT STATUS

The average aspiring dentist of today in Canada is a young man with better than average high school record, whose interest in dentistry as a career has probably been aroused by his family dentist. He most likely comes of a family with a better than average income (the chances are one in five that his father is in the $10,000 per year bracket), and he probably comes from a large town or a city. He applied to enter dental school primarily because he wants to work for people, and has an interest in using his hands to do so; he desires the independence that dental practice offers; and he recognized that dentistry can provide him with a good living.

To achieve his goal he is prepared to work hard for a period of four years following his pre-dental preparation and to make a considerable financial sacrifice during that time. His costs are high for the course, although his payment to the university for the privilege of attending falls far short of the total cost of his training. Large sums are available to enable him to meet his expenses, so that the expenses to which he will be subjected are less of a problem than they were to students a few years ago.

The student will embark on a programme of education and training which has changed little in format over the last thirty-five years. His future success in dental school will depend in part on his scholarly achievements and in part on the development of inherent digital skills. If he is to head his class he will possess a happy combination of both superior intelligence and superior skills. He will find however, that should he be highly intelligent but only moderately successful in digital ability, a number of exciting and useful possibilities are open to him other than dental practice.

Essentially his course will be divided into two major segments, one of which will be in the basic sciences related to dentistry, and the other in clinical sciences. Emphasis on the former will decrease as emphasis on the latter increases and the change in accent will occur about half way through the course. Efforts to decrease the abruptness of this transition have met with some success, but the transition

still must be made. The material taught in individual courses will be up to date, and course content in many instances will bear little if any resemblance to that of a generation ago. The student will spend about 50 per cent of his time learning to understand or practising procedures which will require a high degree of digital and technical skill. It will be a rare student indeed who does not arrive at the end of his undergraduate experience convinced, on the basis of sheer weight of time distribution, that these technical procedures *are* dentistry.

With all its limitations, the fact remains that today's undergraduate course of instruction in Canadian dental schools ranks with the best available. Despite its faults and seeming lack of flexibility it has produced some outstanding professional men and will continue to do so.

THE FUTURE

It is not difficult to follow the development of dental education from its beginning to the present and to understand its relationship to the evolving body of knowledge and to the evolving pattern of society. The growth of dental education has been strong and healthy, although on this continent with perhaps an over-emphasis on technical things for a time. It has benefited greatly from its association with the universities and it has produced some fine dentists who have rendered a useful and necessary service to the public.

Surely, however, we cannot expect that 30 years from now the pattern of dental education will be as similar to the one today as today's is to that of 30 years ago. It seems impossible to believe that in this time of such social, economic, industrial and scientific change dental education will plod along the same pattern forever. It cannot if dentistry is to progress.

If, then, changes are to be brought about, can they be predicted? Is there a path that should be followed that will lead to better dental service through better dental education? A number of factors will influence the future of dental education – factors such as a continually and rapidly expanding body of knowledge, the current social revolution, the changing concepts of the significance of oral health to society, recognition and re-assessment of professional obligations, and the basic objectives of the university. To try to prophesy what will happen in each of these areas and to forecast their influence on dental education are monumental tasks well beyond the limitations of this report. Some things do seem clear however, and will perhaps serve as a beginning.

First, knowledge is rapidly accumulating. Since federal funds became available in this country to support dental research, well over one hundred publications have resulted from work supported and made possible by the provision of this money. In other countries, notably the United States of America, growth of dental research has been even more rapid. As in other disciplines the problem of keeping abreast of the literature in dental research is becoming serious. A great deal of this new knowledge in dentistry becomes incorporated into the teaching of dental students without major changes in the curriculum as textbooks and lecture notes become modified. But the problem is too large to be entirely handled quite this simply. As

advances are made in biology, technology, prevention and treatment, and as the need for the inclusion of other disciplines such as sociology and statistics becomes increasingly apparent, dental school administrators are faced with the extremely difficult problem of trying to find more time in already over-crowded curricula. Demand for more time will not diminish; it will increase. It has become so pressing during the past few years that serious consideration has been given to increasing the length of the dental course from four to five years. This idea has not yet been generally accepted,[1] and there is some question as to whether it would be the best answer to the problem.

Next, dental education will be affected by the changing concept of the relationship between health services and society. Never before in the history of Canada has the idea of state-supported planned health services been more popular – this popularity has been created by the profession itself by making its services indispensable[2]. As Gullett[3] points out "The whole idea of social security is securely married to politics". Canadians seem to want a health service just as other people have wanted and obtained it elsewhere. The desire of Canadians for extended health services must be met in some way[4] and the health professions are being asked to point the way.

The inauguration of the National Health Service in Great Britain nearly 15 years ago has afforded a good opportunity to observe the effects of such a service, both on the provision of dental service and, what is more important to this report, on dental education. The latter effects have been both direct and indirect, and both good and bad. The more direct effects are due to the realization that if more dentists are to be produced in Great Britain the schools will need far more financial assistance than they have been getting. For the first time in history a portion of the grants to support the universities has been earmarked for dentistry. New buildings are going up to create new schools, to expand old ones, and to replace physical equipment and buildings long worn out.

It must be emphasized that the health service has no direct influence on the curriculum in British dental schools. The schools in Britain, as in Canada, are departments of universities. They possess the same degree of autonomy in educational programmes. Anything less would be intolerable. The British Health Service does set fees for specific dental services and it is through the fee schedule that dental education in Britain is influenced indirectly but significantly. The fee schedule is such that the British dentist, to survive in the National Health Service with a maximum of income combined with a minimum of paper work, must confine most of his practice to the restoration of lost tooth tissue with amalgam fillings. Dental students are well aware of this and govern their learning processes accordingly – putting their main effort into those things that will pay off best for themselves in accordance with their own limited view of the future. They put only enough effort into areas such as pre-

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[1] World Health Organization: *Dental Education*. Report of an Expert Committee on Dental Health. Technical Report Series 244. Geneva: The Organization, 1962, p.14.

[2] Taylor, M.G. "The Political Economy of Health Care". *J. Canad. D.A.*, 28(9): 558–563, 1962.

[3] Gullett, D.W. "Social Trends in Dentistry". *J. Canad. D.A.*, 27(6): 378–384, 1961.

[4] Andras, A. "Labour Looks at Health Care". *J. Canad. D.A.*, 28(9): 564–571, 1962.

ventive dentistry and oral medicine to pass the necessary tests for graduation. This is not so for the better group of students in the class but it appears to be true for the majority. Thus, while government plays no direct role in dictating what shall be taught in the curriculum of dental schools of Britain, it has unintentionally and indirectly an adverse influence on what is learnt. This short-sighted attitude on the part of students (and it is not confined to British students), linked to their myopic view of the future, renders frustrating and sometimes ineffectual the teaching of the very subjects which, through development and expansion offer the greatest hope for a more healthy future.

Next, the dental profession in Canada in 1960[1] adopted a policy on the projection of dental services in Canada which is one of the most realistic and enlightened anywhere in the world. The Canadian Dental Association clearly recognized the enormity of the problem of dental disease, its treatment, control and prevention and realizes the need to alter present methods of dealing with the problem if a solution to it is ever to be found. The Association subscribes to the principles of expanded research programmes particularly in the preventive aspects of dentistry, widespread application of established preventive measures, establishment of more training facilities for dentists and their auxiliaries, and expansion of the services that auxiliaries may be permitted to perform. The Association recognizes that other steps will have to be taken as well, although the others have probably less direct application to dental education than the ones mentioned.

This recognition of professional responsibilities and re-evaluation of policies and practices in dentistry is not confined to this country[2] nor is it confined to dentistry.[3] The role of dental education in the development of modern policy will be highly significant. The schools will carry out most of the research; they will develop and teach the preventive measures; they will be involved with expanded training facilities for dentists and with providing and training staff for the new facilities; they will conduct the programmes for training auxiliaries, and will lead in the developing and teaching of other services that auxiliaries could perform and they will integrate these activities with the training of dentists.

Finally, dental schools must try to do all of this without violating the basic purposes of universities. The research being conducted in dental schools fits well within these terms. While the dental research programme in Canada is still far too small, it is sound and useful and it is growing. Similarly there is no quarrel with the teaching in dental schools of the basic courses dealing with the principles of biology and their application to health and disease; nor surely can there be disagreement with the view that teaching of the *principles* of how to prevent, control or treat oral disease is a university discipline. As has already been pointed out, the violation of the basic purposes of a university occurs in dental schools when students are required to perform technical acts repetitively in order to acquire the digital skill necessary for licensure.

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[1] Canadian Dental Association: *Official Actions 1950–60*. Toronto, 1962, p. 30.

[2] Leatherman, G.H. "Dentistry and Its Future". *Jour. Am. Coll. of Dentists*, 28:163–186, 1961.

[3] Hastings, J.E.F. "Medical Education – the Challenge of Changing Patterns". *Canad. Med. Assoc. J.*, 84:699–702, April 1961.

How then are the schools simultaneously to satisfy the demands of society, of the profession, and of the university? They could of course remain in a state of status quo, a state that would soon become completely intolerable. For years dental educators have been concerned with the training of dentists to practise in the future but to date little evidence exists to indicate that this concern has led to much successful effort. In fact, when comparing today's curriculum with that of twenty-five or thirty years ago, one is left with the idea that perhaps dentists are being trained to work in the past. For the most part dental students are not prepared to understand the society in which they will find themselves. In fact hygienists get more instruction in sociology than do the dental students. After many years there is still concern with the integration of basic sciences and clinical dentistry, with the lack of time for teaching preventive dentistry and oral medicine, and with the inordinate amount of time spent on instruction in drill and techniques. Yet the schools, in effect, still have the responsibility to ensure that graduates not only merit a university degree on completion of their training period but are fit to be licensed to practise immediately on graduation. The schools are therefore faced with an impossible task of trying to expand teaching in courses already established, to introduce new courses, to relieve an overcrowded curriculum, and still retain their unofficial responsibility for the qualification for licensure.

One way out of the schools' dilemma would be to lengthen the university course by adding a year, as has already been suggested. This would allow expansion of basic science teaching and better opportunity for applied basic science courses during the clinical years. Sciences related to human behaviour could become part of the dental curriculum and still adequate time could be available to permit the acquisition of the minimum skills necessary for practice. Such a change would require a large expansion of the clinical facilities in all of the university dental schools and a large number of additional staff members would be required for the extra teaching involved. For this reason it would probably be unfair to ask universities to agree to such an expansion. If this should become the only solution to the problem, then the universities should be subsidized to meet the full cost of operating the extensive clinical operation involved.

A far better and more hopeful way out of the difficulty has been suggested by Ellis[1] – the provision of dental clinics or hospitals in which dental students may spend a period of time as interns following graduation. Such an arrangement would go far toward solving the problems of dental education and at the same time would provide a useful public service.

In the evolution of medical care the provision of service has largely migrated out of the private office of the general practitioner (where it is still confined in dentistry), to hospitals. In the hospital the specialist, the auxiliary, and the necessary special services are gathered together to provide the best treatment. This, of course, changed the role of the medical general practitioner. He now generally provides much less treatment than he used to and spends far more time in diagnosis. While changed, his services are no less valuable and appreciated. In the future of the provision of

[1]Ellis, R.G. "A Review of Dental Education Suggests a Fertile Field for Research". *Austr. Dent. Jour.*, 1:8–11, 1956.

dental services, a similar transition seems to be on the way. If and when it does come, and dental clinics provide a large amount of necessary dental service, a far different and more exciting vision of dental education in the future can be envisaged.

The words "dental clinic" or "dental hospital" are used here to mean an outpatients' department of existing general teaching hospitals. This will involve a close liaison between the hospital and those entrusted with organizing the dental clinic. Some new rules and regulations may have to be evolved for the dental department, whose development may be hampered if it has to adhere solely to rules designed for departments with far different purposes. Dental departments should provide not only emergency service and treatment for those that require hospitalization, but they should give dental service of all types to those eligible to apply.

At least one large clinic should be in close association geographically, physically, administratively and scholastically with each existing dental school, although all would not have to be. The clinic could form the place in which auxiliaries such as dental assistants, dental hygienists, and dental technicians, could be trained. Graduates of the dental schools could serve an internship there in order to acquire the experience and skills they must now obtain in dental school in order to qualify for licensure. Under such an environment graduates could obtain a wider clinical experience than is now possible in the schools. They could also experience an environment in which their obligations to provide an emergency service could be emphasized. At present this experience forms a very limited part of a dental school. Working as interns on salary, graduates in dentistry might also repay some of the debt they owe society for their education. Most important, licensing qualifications would no longer be dependent on the judgment and decisions of the staffs of the dental schools. This responsibility would in fact be turned back to the licensing boards where the responsibility legally lies.

Under such a system dental students could receive a much broader training to perform services considerably beyond present possibilities. The time now required by students to become sufficiently skilled in technical clinical performance seems to be about one year. If this duty could be relegated out of the dental school, it would have the effect of providing almost another full academic year for additional teaching without adding to the length of the university programme. A number of steps could then be taken to bring dental education closer to its proper objective of training students to become dentists rather than training them to be dentists.

Courses in the basic sciences could be adjusted so that in all schools each basic science course was equivalent in scope, though not necessarily identical in detail, to the corresponding course in medical schools. Clinical teaching could expand and emphasize the basic principles of diagnosis, and the philosophy and principles of treatment, and be far less concerned with the supervision of repetitive performance of the treatment procedures. Much of the material now limited to courses leading to specialist certification could be brought back into the undergraduate curriculum. The background of knowledge and the techniques involved in specialties are more extensive but not more incomprehensible than the background required for the general practice of dentistry. In the universities the dental course could contain only sufficient clinical operating time that students might obtain some minimal understanding of the principles they have been taught.

While a requirement of a year of internship would extend the time required for licensure by a year, this need not be a full calendar year. Experience over the past two or three years in Canada has shown that it is possible to accelerate the clinical years in dental school (i.e., the third and fourth) by running them together with reduced holiday period between and without sacrificing teaching quality. Doing so considerably reduces the problems created by closing the school clinics for long periods each year. If the two senior years in dental school were not separated by a long vacation, and if the internship began immediately following completion of fourth year, the time extension would be in the order of six months and the end product would be a far better trained dentist.

Dental clinics in teaching hospitals could provide a place for all dental auxiliaries to be trained outside the university. This would permit formal courses to be established for dental assistants and technicians under the aegis of the hospital, with a resultant help to the dental profession and relief to the dental school. Dental school staff could still give instruction to auxiliaries in their general background courses such as biology, but clinical performance and supervision would be taken outside the university. This would also permit dental interns an opportunity not now available to work with auxiliaries and to learn to supervise and co-ordinate their work.

Training of clinical specialists should also primarily occur in the hospitals. Here, too, the basic background of biology and medicine could be presented in the dental school, but the clinical experience obtained in the hospital. The opportunities created through hospital dental clinics for the development of the long neglected field of clinical research in dentistry would serve an excellent purpose in the training of specialists. At the same time the schools could direct their energies at the postgraduate level to the development of true graduate teacher-training programmes.

In summary, the development of extensive out-patient departments in teaching hospitals would go a long way towards solving many of the problems facing dental education. It would permit the schools to become true university departments, with objectives they could meet without the present frustrations. It would give the schools an opportunity to produce graduates far better qualified in the field of oral medicine; it would relieve the universities of their inferred responsibility of certifying clinical competence; it would provide more, better trained and better integrated auxiliaries for dentistry. Such a development would place the training of specialists in the right locale; it would provide a better opportunity for the development of research in the clinical areas; it would give dental graduates an opportunity to provide a community service at little cost to the community and at the same time provide a place for graduates to obtain a useful clinical experience before entering graduate study. In short, the expansion of out-patient departments could be the first major step required to relieve the almost unbearable pressure to which dental schools are being subjected.

Finally, providing an environment in which dentists and physicians, and dental and medical interns can work together for the common good of patients, might at long last begin to break down the barriers built by evolution, tradition and sometimes self-interest that have so long divided medicine and dentistry, and which have not always been in the best interests of the sick.

BIBLIOGRAPHY

AMERICAN DENTAL ASSOCIATION: *Dental Students' Register, 1961–62.*

ANDRAS, A. "Labour Looks at Health Care". *J. Canad. D.A.*, 28(9): 564–571, 1962.

BADGLEY, R.F. "Sociology in the Medical Curriculum". *Canad. Med. Assoc. J.*, 74:705–709, 1961.

BAGNALL, J.S. "Dental Teaching in Canada". *J. Canad. D.A.*, 20:603–609, 1954.

BAIRD, K.M., SHILLINGTON, G.B., and PROTHEROE, D.H. "Pilot Study on the Advanced Training and Employment of Auxiliary Dental Personnel in the Royal Canadian Dental Corps". Preliminary Report. *J. Canad. D.A.*, 28(10):627–638, 1962.

BAIRD, K.M. "Recruitment of Dental Students Through Subsidization". *J. Canad. D.A.*, 27:642–644, 1961.

BINGAY, J.V. "The Training School for Dental Auxiliaries". *Brit. Dent. Jour.*, 109:178–180, 1960.

BISSELL, C.T. *President's Report.* University of Toronto, 1961.

BLACKERBY, P.E. "Why Not a Department of Social Dentistry?" *Jour. Dent. Educ.*, 24:197–200, 1960.

BROWN, H.K. "The Health Professions and the Challenge of Widening Horizons and Changing Patterns". *J. Canad. D.A.*, 28(1):1–5, 1962.

BURKETT, L.W. "Changing Dimensions in Dental Education". *Jour. Dent. Educ.*, 23:81–88, 1959.

CANADIAN DENTAL ASSOCIATION: Brief submitted to the Royal Commission on Health Services. Ottawa, March 1962.

_____ Bureau of Economic Research: "The Relationship of Dental Auxiliaries to Increased Productivity and Income". *J. Canad. D.A.*, 27(7):446–448. 1961.

_____ *Canadian Dental Survey Manual, 1959.*

_____ *Dental Economics News Letter,* Vol. 1, No. 1, Dec. 1962.

_____ *Official Actions 1950–60.* Toronto, 1962.

_____ "Survey of Dental Practice". 1958. *J. Canad. D.A.*, 25:638, 1959.

_____ *Survey of Dental Students. 1962.*

_____ *Survey of Recent Graduates. 1962.*

_____ "Survey of Dentists' Attitudes Toward Recruitment". *J. Canad. D.A.*, 27(12):799–807, 1961.

_____ *Transactions. 1960.*

_____ *Transactions, 1962.*

CHASE, MARY EVANS. Director of Admissions, Wellesley College. *New York Times Magazine,* November 29, 1959.

DOHERTY, R.E. *The Development of Professional Education.* Carnegie Institute of Technology, 1950.

ELLIS, R.G. "A Review of Dental Education Suggests a Fertile Field for Research". *Austr. Dent. Jour.*, 1:8–11, 1956.

_____ *Report of Dental Health Services in New Zealand and Australia.* Canadian Dental Association, 1951,

EDITORIAL: "The Future of Dentistry". *Dental Cosmos*, 14:608–611, 1872.

EDITORIAL: Jour. Dent. Ed., 23:80, 1959.

THE FACULTY OF DENTISTRY, University of Toronto. Brief submitted to the Royal Commission on Health Services, Toronto, May 1962.

FARQUHARSON, R.F. "Support of Medical Research in Canada". *Canad. Med. Assoc. J.*, 86:687–689, 1962.

FISH, W. "Designing Dental Education". *Brit. Dent. Jour.*, 97:1–11, 1955.

FLEMING, W.C. "Role of Dental Research in Dental Education". *Jour. Dent. Ed.*, 21:318–323, 1957.

_____ "Presidential Address". *Jour. Dent. Ed.*, 12:10–14, 1947.

FLEMMING. HON. HUGH JOHN. Address to Ottawa Rotary Club, quoted in *The Globe and Mail*, Toronto, October 17, 1961.

FLEXNER, A. *Medical Education – a Comparative Study*. New York, The MacMillan Company, 1925.

FULTON, J.T. "Experiment in Dental Care. Results of New Zealand's Use of School Dental Nurses". World Health Organization: Monograph Series. Geneva: The Organization, 1951.

GIES, W.J. *Dental Education in the United States and Canada.* Carnegie Foundation for the Advancement of Teaching. New York, 1926.

GRAINGER, R.M., and FLOWERS, J.F. *Aptitude Tests. Report to the Council on Dental Education of the Canadien Dental Association. March 1962.*

GRUEBBEL, A.O. "Objectives of a Course in Public Health Dentistry". *Jour. Dent. Ed.*, 20:114–118, 1956.

_____ *A Study of Dental Public Health Services in New Zealand.* American Dental Association, 1950.

GULLETT, D.W. "Notes on the Development of the Canadian Dental Association". *J. Canad. D.A.*, 18:303–307, 1952.

_____ *Notes on Dentistry in Europe.* Canadian Dental Association, 1957.

_____ "Social Trends in Dentistry". *J. Canad. D.A.*, 27(6):378–384, 1961.

_____ Personal communication, 1962.

GURLEY, J.E. *The Evolution of Dental Education.* American College of Dentists. St. Louis, 1960.

HARDWICK, J.L. "The training of the Undergraduate Dental Student." *Brit. Dent. Jour.*, 99:131–142, 1955.

HASTINGS, J.E.F. "Medical Education – The Challenge of Changing Patterns". *Canad. Med. Assoc. J.*, 84:699–702, April 1961.

_____ *Labour's Plan for a Medical Care Programme for Toronto.* Toronto Labour Health Centre Organizing Committee, 1962.

HOLLINSHEAD, B.S. "The Education of the American Dentist". *Harvard D. Alum. Bul.*, 20:96–102, 1960.

HORNER, H.H. *Dental Education Today*. Chicago: University of Chicago Press, 1947.

HORSNELL, A.M. "Dental Education in Great Britain". *Journ. Amer. D.A.*, 50:501–506, 1955.

HUMPHREYS H.F. "Universities and Dental Education". *Brit. Dent. Jour.*, 103:155–158, 1957.

LEATHERMAN, G.H. "Dentistry and Its Future". *Jour. Am. Coll. of Dentists*, 28:163–186, 1961.

LEVY, B.M. "A Challenge to Dental Education". *Jour. N.Y. State D.A.*, 26:37–40, 1955.

MACDONALD, J.B. *Prospectus on Dental Education*. University of British Columbia. 1956.

_____ *Dental Education in British Columbia*. University of British Columbia. 1961.

_____ "The Role of Basic Sciences in Dental Education". *Jour. Dent. Ed.*, 21:17–21, 1957.

MacGREGOR, A.B. "The New Birmingham Dental School". *Brit. Dent. Jour.*, 111:145–149, 1961.

MacKINNON, F. "The University: Community or Utility". *The C.A.U.T. Bulletin*, 10(2): 4–11, 1961.

McINTOSH, W.G. "Teaching and Research". *Jour. Am Coll. of Dentists*, 26:168–178, 1959.

MÉMOIRE de la Faculté de chirurgie dentaire de l'Université de Montréal. A la Commission royale d'enquete sur l'éducation dans la province de Québec, 1962.

NEW ZEALAND SCHOOL DENTAL NURSES. Report of United Kingdom Dental Mission to the Ministry of Health. Department of Health for Scotland. Ministry of Education. London, 1950.

NOYES, H.J. "Trends in the Dental Curriculum for the Next Decade". *Jour. Dent. Ed.*, 21:203–208, 1957.

O'ROURKE, J.T., and MINER, L.M.S. *Dental Education in the United States*. Philadelphia and London: W.B. Saunders Co., 1941.

PAYNTER, K.J. *Concerning the Establishment of a School of Dentistry in Manitoba*. Government of Manitoba, 1956.

PROCEEDINGS: Conference on Utilization and Training of Dental Assistants. Council on Dental Education, American Dental Association and American Association of Dental Schools. September 13–15, 1960.

REPORT of the Committee on Recruitment of the Dental Profession. London: H.M. Stationery Office, Cmd. 9861. October 1956. (McNair Report).

REPORT to the Honourable Gordon Churchill, Chairman, The Committee of the Privy Council on Scientific and Industrial Research by the Special Committee to Review Extramural Support of Medical Research by the Government of Canada. November 1959.

REPORT of the Medical Research Council 1960–61. London: J.M. Stationery Office, Cmd. 1789. July 1962.

ROBERTSON, A. "A Commentary on Sociology in the Medical School". *Canad. Med. Assoc. J.*, 84:703, 1961.

ROBINSON, H.B.G. "A Projection of Trends in Dental Education". *Jour. Am. Coll. of Dentists*, 27:173–176, 1960.

_____ "Dental Education Versus Orthodontic Education". *Am. J. Orthodont.*, 47:164–173, 1961.

RODGERS, R. "Higher Education: Crisis and Contradiction". *The C.A.U. T. Bulletin*, 10:5–8, 1962.

ROYAL COLLEGE OF DENTAL SURGEONS OF ONTARIO: "Future Dental Manpower Requirements and the Training and Utilization of Auxiliary Personnel". Report to Directors, Vo. VII: No. 1, Jan. 31, 1962.

_____ *Proceedings*. April 1962.

RUSHTON, M.A. "The Young Dental Teacher". *Brit. Dent. Jour.*, 103:158–159, 1957.

_____ "Dentistry and the Universities". *Brit. Dent. Jour.*, 108:64–69, 1960.

SCOTT, J. "A Dental Curriculum". *Brit. Dent. Jour.*, 111:161–163, 1961.

SECCOMBE, W. "A Plan for the Development of Research in a Faculty of Dentistry". *Proceedings:* American Association of Dental Schools. 5th Meeting: 66–75, 1929.

SOGNNAES, R. "American Dentistry – Early Traditions and Recent Trends". *Jour. Dent. Ed.*, 25:111–114, 1961.

STONES, H.H., and Lawton, F.E. "Dental Education in the United Kingdom". *Internat. D.J.* 6:416–430, 1956.

STOY, P.J. "Medical and Dental Students – a Comparison", *Brit. Dent. Jour.*, 98:356, 1955.

SURVEY OF DENTISTRY. *The Final Report.* Commission on the Survey of Dentistry in the United States. American Council on Education. Washington, D.C., 1961.

TAYLOR, M.G. "The Political Economy of Health Care". *J. Canad. D.A.*, 28(9):558–563, 1962.

THOMPSON, J.S. "Wanted: More and Better Medical Students". *Canad. Med. Assoc. J.*, 84:689–691, 1961.

UNDERHILL, F.H. "The Liberal Arts and Public Affairs". *The C.A.U.T. Bulletin*, 10:11–25, 1962.

U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE. "Training Dental Students to Use Chairside Assistants". Summary of a Conference, January 14–15, 1960. Washington, D.C.

WAITE, F.C. "The Divergent Paths of Dental and Medical Education since 1840". *American Dent. Surgeon*, 49:349–367, 1929.

WALLIS, C.P. "An Assessment of the Changing Basis of Dental Education". *Brit. Dent. Jour.*, 111:163–166, 1961.

WARD, N.L. "The University Education of the Dental Student". *The D. Practitioner and D. Record*, 11(8):254–259, 1961.

WEINBERGER, B.W. "The Educational Evolution of the Dental Surgeon". *Dental Cosmos*, 71:516–526, 565–575, 1929.

WESTIN, G. "Alternate Roads to Advanced Education for the Dentist – Sweden". *Jour. Dent. Ed.*, 25:153–156, 1961.

WILKINSON, F.C. "Dental Education". *Brit. Dent. Jour.*, 109:163–168, 1960.

WILLARD, W.R. "Social Dentistry as Viewed from the Perspective of Education for Medicine and Other Health Professions". *Jour. Dent. Ed.*, 24:201–205, 1960.

WYLIE, W.L. "Motivation for the Study of Dentistry". *Jour. Am. Coll. of Dentists*, 22:292–293, 1955.

WORLD HEALTH ORGANIZATION: Expert Committee on Auxiliary Dental Personnel. Technical Report Series 163. Geneva, 1959.

_____ *Dental Education*. Report of an Expert Committee on Dental Health. Technical Report Series 244. Geneva, 1962.